# Better Crops with PLANT FOOD

Aug.-Sept. 1939 10 Cents

The Pocket Book of Agriculture

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**AMERICAN POTASH INSTITUTE, INC.**

**INVESTMENT BUILDING** **WASHINGTON, D. C.**

# Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

*Editorial Office:* Investment Bldg., Washington, D. C.

VOLUME XXIII NUMBER SEVEN

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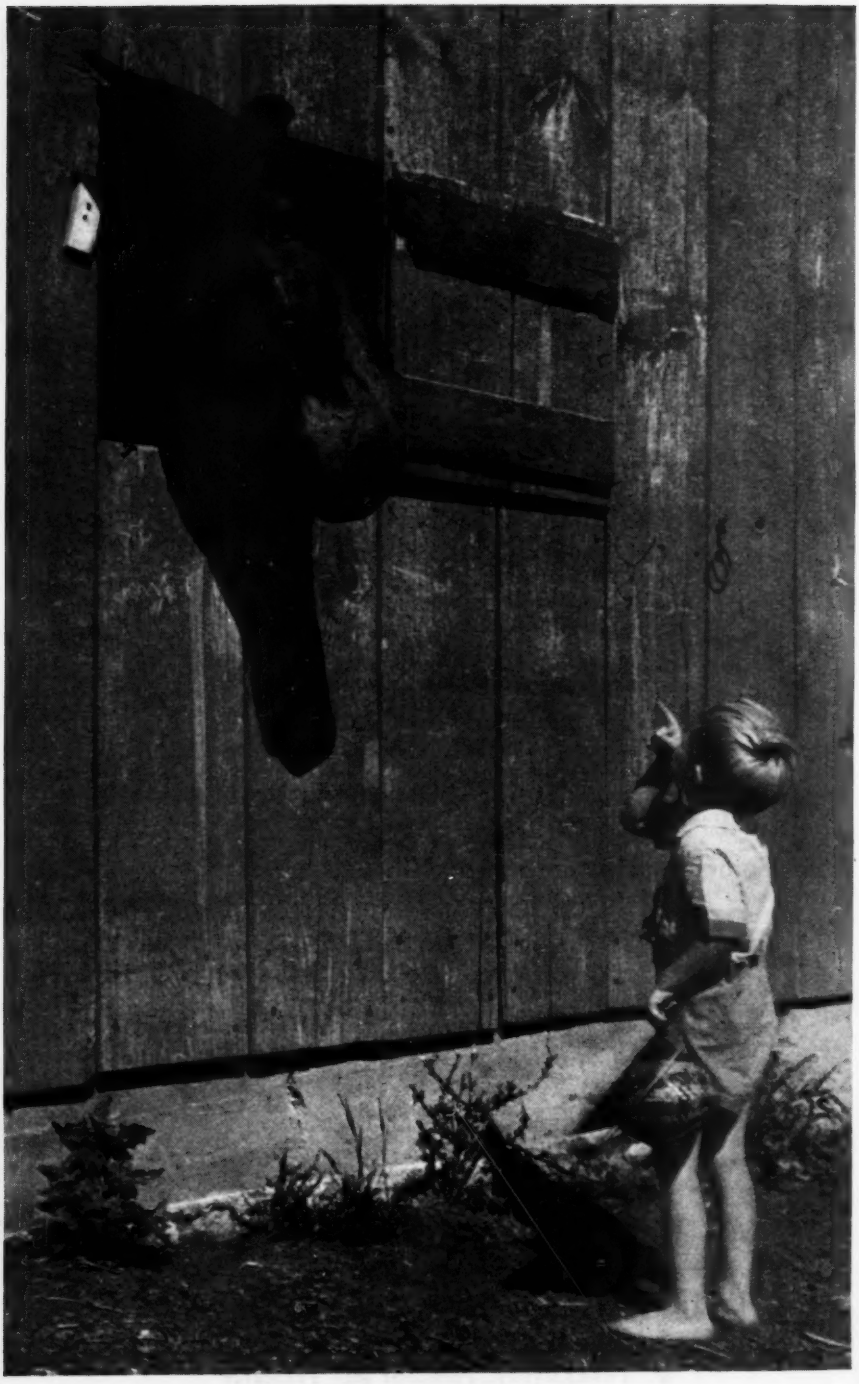

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*Regretfully Jeff bids—*

# Farewell to Summer

*By* Jeff McDermid

IF THE American Institute of Public Opinion took a survey on the proposition of an extended term for Summertime, the favorable vote would be 99 per cent to 1 regardless of what candidate or platform Winter offered. I am quite sure we could even bank on support from those suffering from extreme obesity, sunburn, and hay fever. The only member of my clan ever to register a negative attitude on summer was an uncle who said that nobody cared how many clothes you piled on to keep comfortable in winter, but that the law wouldn't let you take off enough to be happy in summer. Inasmuch as freely exposed epidermis is no longer a legal barrier in social circles, Uncle Bellicose could also switch his vote to the sunny side.

I am fully cognizant of the fact that an official astronomical decree to extend the summer solstice would perplex the doughty old AAA almost as much as a sudden shift in political alignment. It would be an awful drag on the capacity of the new concrete corn bins erected by a determined government, and the breakfast food companies would have to serve chopped alfalfa to help utilize the surplus of carotin vitamins. An extended summertime with well-distrib-

uted rainfall would no doubt have certain dark and dismal economic "repercussions" and maybe modify plant food and soil chemistry reactions. You can't move anything these days without a crisis.

In short, I am sure that if we acted on my proposal and abolished winter altogether we should find even the most adamant Republicans quite willing to continue subsidies for fallow land and green manuring. The while, the occasional lazy farmer would get just twice his normal enjoyment watching the tater bugs nibble his vines to keep the price under seventy-five per cent of parity.

This necessity of estimating economic climaxes and dilemmas whenever we propose to do anything for the comfort of the human race is getting under my skin. When I was young we never paused to peer ahead and discern what the next generation might have to endure because we went on a spree. The world was ours in those days, and now it belongs to nobody. Why, away back in the nineties a plea to extend summertime indefinitely would have met instant acclaim because we did not then grow things so fast and furious, and we could ship everything extra off to Europe except erosion and the mortgage.

NEVERTHELESS the physical and psychological benefits and comforts of an extended summertime appeal to me immeasurably. To begin with, I belong to that gaunt and bony crew who carry no reserves of fats and oils to stifle the sebaceous glands amid the thermal waves of summertime. Yet I get almost as much pleasure out of something liquid served with ice as do those cushioned with excess embonpoint. Whatever I eat goes to build brains and philosophy instead of more gout and a belt-line with belches. On the contrary winter pinches my soul and warps my hopes, and I cannot absorb enough ultra-violet during vacation sunshine to eke out my eclat through the snowbank season.

Yet best of all reasons I prefer summertime to colder spells is that it grants us the boon of being in our shirt-sleeves mentally and spiritually; enabling us to cast off the formality and cover-uppery of overdressed defenses. There is a sort of vacation-time camaraderie in the redolent atmosphere of June, July, and August which keeps us someway in closer touch with those aspirations and sympathies which governed us in barefoot days of fishin' holes and tangle-trails. It sort of sets us back on our ordinary haunches.

IT IS EASIER to live and it would be simpler to die, it somehow seems to me, in the long days of summer. Yes, even when I mow the back garden, rip out a few of Mother's posies by mistake, and get a bumble-bee in my breeches (also by mistake), I still revel in the feeling spiritual to match the scene arboreal. I admit there is tang and tingle to shoveling snow along the lengthy sidewalk, but the chief joy in that lies in returning to where there is ruddy warmth aglowing, whether by furnace or egg-nog. Thermal radiation wins every way you look at it. It loosens us up and lubricates us in every pinion and eccentric wheel we have.

Of course you can lie in the sun and get to resemble raw beef or vulcanized leather, if you want to be smart—but unless you have a heap of original cussedness to boil out, I'd advise staying within the bounds of reason. We can be free and easy without frying.

SUMMER lets us down from distraught levels of artificial living, induced by too much stuffing and overcoating. One sees the social value of it on any summer night—any summer night like all those summer nights we have passed together in the hamlets of inland America. You recall how the screened front door would slap open, and the folks would drag out the chairs —the comfortable attic relics, not the hair-covered parlor ornaments—and

somebody would string up the frayed old hammock between the west porch posts. The crickets would begin to hum, and the frogs in the marsh would start croaking, the twilight would deepen to dusk, the arc light at the corner would flash on, the doodle bugs would dodge the bats beneath its glinting rays, and a few victrolas might play "Hiawatha," "Hot Time in the Old Town," or "Break the News to Mother."

Peter Jones and Sally Smith would saunter by on their way to the drug store for fresh strawberry sodas, and maybe Dad would take the cue and send out for the suds (insert your own refreshments). Perhaps somebody would stop in before nine o'clock for a harmless round of gossip, or to compare early tomato sizes, measure fish that escaped, or ask when the council would wake up and give us sewage systems instead of blow-fly "specialities."

This was a perpetual shirt-sleeve and apron receiving line, a reception without frills, the place where the McKinley campaign got its toe-hold on the voters with the front-porch acceptance idea. Mark Hanna, whose benign visage smiles down from a marble seat in the Cleveland parkway, never conjured a sweeter political trick than this one of opening a presidential drive on the front porch in July. It was better than starting out with prayers.

YOU knew where everybody would be of an evening, unless sickness intervened or somebody went to jail. Next to morning's back-yard fence congeniality, the good old stoop in summertime was the reservoir of democracy and progress, the recreation spot after a sweaty day. It was the heart of home exposed.

What portion of this condition has persisted to keep me firm in the belief that summertime still makes us commonplace and natural, one to another? Well, we can't carp about lost simplicity, at least in scanning the present era. It isn't a shirt-sleeve party anymore for one thing, because they've taken off their shirts. Yea, verily, they also removeth the pants. Hairy arms and bulging muscles, pink toes and curving thighs, or just plain ornery knockknees, flat chests, and bunions —all reduced to a common scenic denominator with the village green and the town hall. Some of us found it hard to follow the leader in this ultra zest for the ozone, but we winked a few times, have taken our last rebellious gulp, and permitted the disrobing fashion to assume the place which front-porch parties once held in democratic relaxation.

For the front porches are mostly gone, and family parties are enjoyed on wheels. We are just as simple as ever, but we want to enjoy both our own local summertime and somebody else's maybe five hundred miles away.

Yes, I persist in claiming that summer excels in its revitalizing simplicity. Even after you allow for the road-hog nuisance and the terrific accident rate on summer holidays, you are going to admit that a quiet drive along wooded streams amid the everlasting hills gives you as good a lift as the beer can and the porch swing of yesterday.

Thus times may change and invention and science may drift us off of old sand-bar moorings, but we still steer our craft in a perpetual seeking after the simple things that are good, the human values that live beyond our passing day.

I shall not be surprised, therefore, to learn that a laboratory man somewhere

(*Turn to page* 47)

# Clover Improves Florida Pasture

*By R. E. Blaser*

Florida Agricultural Experiment Station, Gainesville, Florida

FLORIDA'S livestock industry must rely largely on pasturage for the entire year, since it is difficult to make hay with prevailing heavy rainfall and concurrent heavy dews during the summer. Most pasture plants utilized at present furnish an abundance of feed during the spring to fall period of the year, but the cool winter temperatures limit growth of such pasture plants as Carpet, Bahia, Bermuda, Napier, and Dallis grasses which are commonly used in Florida. Range beef animals lose weight and often die because of feed deficiencies during the winter months.

White Dutch and other pasture clovers are desirable in the Florida pasture program because:

(1) Clovers will furnish feed during the winter and early spring when there is a shortage of feed.

(2) Florida soils are low in nitrogen, and clovers may be used to build up the nitrogen content of the soil to augment grass growth.

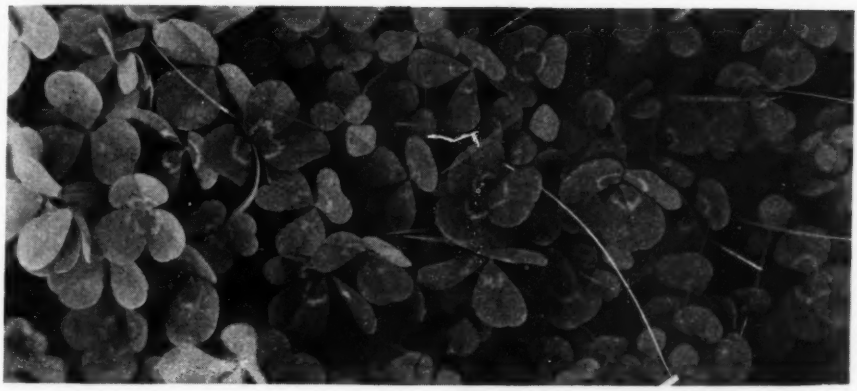
(3) The admixture of clovers and grasses will increase the mineral and protein composition of pasture herbage as well as the quantity of feed produced.

Extensive research on the possibilities of growing clovers in Florida was initiated in the fall of 1937. These clover experiments were designed to determine soil type relationships, nutritive requirements, seeding and inoculation technique, and strains best adapted to Florida.

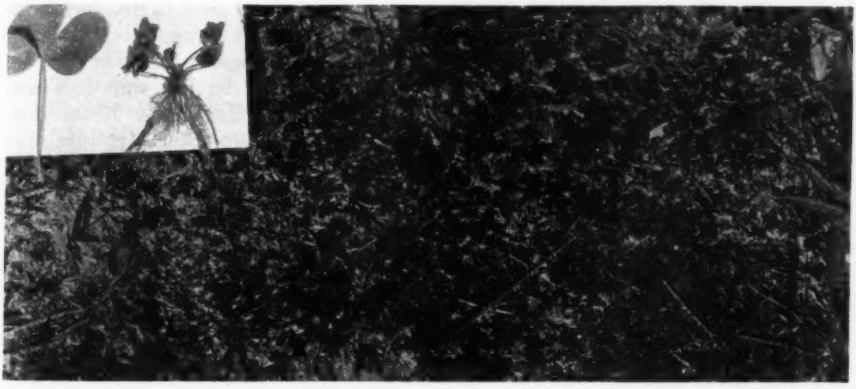
Soil types are important primarily from the standpoint of adequate moisture relationships. Clover seedings on high sandy soil types such as Norfolk fine sand failed because of insufficient moisture. Norfolk fine sandy loam and other upland soils which are high in clay support good clover growth. The low flatwoods sandy soils, of which there are large acreages in Florida, are very desirable for clovers, because of a favorable moisture supply during the winter months, the low rainfall period. These flatwoods sandy soils are also desirable, because any fertilizer elements added (particularly phosphorus) generally remain in a readily available condition for plant growth.

### Clover Needs Fertilizer

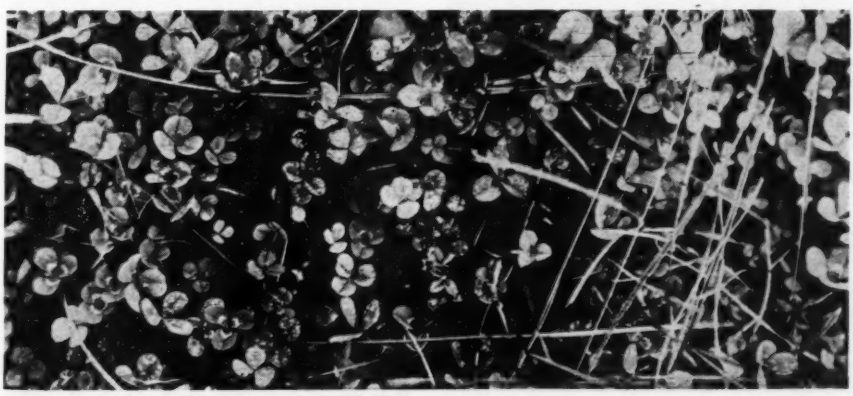
Experimental results show that clovers require a higher fertility level than Carpet grass, which is the most common pasture grass in Florida. Soils which have not been fertilized generally require a combination of 2,000 pounds of ordinary or dolomitic limestone, 600 pounds superphosphate (18% $P_2O_5$), or its equivalent in other phosphates, and 100 pounds of muriate of potash per acre, or its equivalent in another source of potassium. On truck crop soils which were heavily fertilized with complete fertilizers, fair clover growth can be expected without fertilization. It is desirable and practical to fertilize these truck crop soils with lime and potash; phosphates accumulate and need not be supplied. The importance of supplying a combination of lime, phosphate, and potash is seen in the pictures show-



**White Dutch clover fertilized with 1 ton lime, 600 lb. superphosphate (18% $P_2O_5$), and 100 lb. muriate of potash per acre produced excellent clover growth.**



**Superphosphate was omitted causing phosphate deficiency symptoms. Lack of phosphorus causes extremely dwarfed clover. The plants are dark green in color during early symptoms, but eventually turn purple and succumb.**



**Potash was omitted. Potash deficiency causes a leaf spot, the leaves finally turn a yellowish brown color and plants die. This deficiency is most pronounced when heavy applications of lime and phosphates are made.**

ing phosphate and potassium deficiencies of White Dutch clover.

The frequency with which these fertilizer materials must be supplied is not yet known. Clovers have produced good vegetative growth for 2 years with the combination of fertilizer materials previously mentioned. A well-established Carpet grass-clover sward reduces excessive leaching of calcium and potassium on sandy soil types, making fertilization with these elements economical.

### Best Growing Conditions

The value of nitrogen fertilization for clovers is a controversial subject in various parts of the United States. Under Florida conditions, light applications of nitrogen fertilizers (12 pounds nitrogen per acre) have given as good a response as much heavier applications. The fall of 1937 was a favorable year for starting clovers because of the abundant rainfall, while the rainfall was scant during the fall of 1938. Nitrogen fertilizer in combination with lime, phosphate, and potash increased the earliness of clover somewhat in 1937, but this condition was more pronounced in 1938. Apparently nitrogen fertilization is more beneficial for clovers under adverse conditions when the nitrogen-fixing organisms do not function properly. Good clover growth, however, was obtained both years without the addition of nitrogen.

**Clover and grass produce an excellent grass sward. The clovers greatly stimulate grass growth by the nitrogen added to the soil.**

Clovers (*Trifolium spp.*) are foreign to Florida, and the soils are not supplied with the nodulating bacteria. The success of clover is therefore dependent on proper inoculation technique. Best nodulation and clover growth are obtained by using commercial cultures at three to five times the recommended rates. The addition of sirup to moisten all seeds, followed with the supplying of the culture and mixing well with the subsequent addition of cottonseed meal to dry and separate the seeds, has given especially good results. The inoculated seed should be planted so that the hot sun does not contact them. This may be accomplished by seeding the clover just previous to a rain or in late afternoon, followed with a light disking and subsequent rolling with a cultipacker before bright sun the next morning.

Clover plantings have been made from August to February. The plantings made in October have given best results, while the August, January, and February plantings resulted in failure. These plantings should also be made on closely grazed sods to avoid light competition.

Two tests with 16 varieties and strains of clovers on two soil types with three levels of fertilizers (combination of lime, phosphate, and potash) to study nutritional requirements and growth curves of varieties of clover indicate the following results: (1) White Dutch clover (Louisiana, Dixie, Ladino, Kent Wild, and Oregon varieties) and Persian clover have given best results on moist to wet soils. (2) California Bur, sweet clover, and Black Medic do best on well-drained soils. (3) Little Hop clover seems to be widely adapted. (4) The White Dutch clover varieties and Persian clover do well on acid soils, pH 5.0 to 5.6, while the Bur clovers require more lime. (5) White Dutch

clover varieties and California Bur clover furnish earlier grazing (generally in January) than most of the other clovers.

It is important to increase the nitrogen content of Florida and other southern soils to augment grass growth. Carpet grass fertilizer studies on five soil types indicate that the carrying capacity of this grass may be increased by more than 100 per cent with a light application of complete fertilizer and subsequent nitrogen applications. On soils where clovers can be grown, it seems practical to furnish the soil with lime, phosphate, and potash, so that the clovers will supply the nitrogen for subsequent and concurrent grass growth.

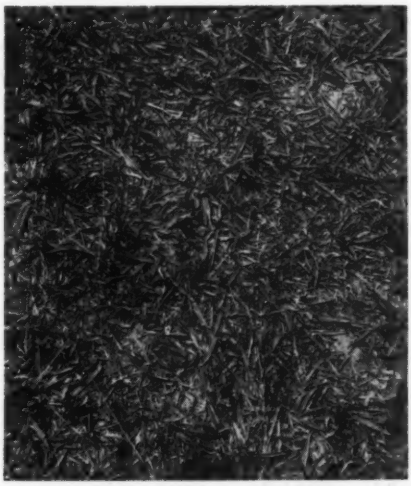
### Encouraging Results

On the basis of these research results, county agents in Florida have taken an active interest in the clover program. Cattlemen cooperating with county agents and fertilizer concerns planted approximately 3,000 acres of clover in the fall of 1938. These clover seedings were trial plantings.

A recent inspection tour indicated that these trial clover plantings have given very encouraging results, and acreage will be increased in subsequent years. Some of the plantings failed because of the extremely dry conditions in some parts of the state, while other plantings failed because all essential factors for establishing clovers were not properly executed.

Most of the trial clover plantings made by farmers were seeded with White Dutch clover (Louisiana variety). Results show that management practices will greatly influence the grazing returns. In some cases the clover was grazed immediately after seeding, which retarded seedlings and naturally required a longer period of time to get a good sod. In other plantings the cattle were removed until the clovers matured seed, after which grazing was initiated. In one case the clover was mowed, because this particular cattleman feared that the clover would exterminate the Carpet grass sod.

To obtain optimum yields, White Dutch clover should be grazed when it reaches a height of 4 inches. After it has been grazed down, the cattle should be removed until a new growth of 4 to 5 inches in height has developed, when it should again be grazed. Clovers grazed according to these practices develop a rapid new growth and also spread laterally to utilize a larger portion of the soil nutrients and water supply. This practice will permit early utilization of feed, and cattle should be removed to allow reseeding in May or June when other grasses can furnish feed to animals.



**Carpet grass without clover or nitrogen fertilization is low in yielding capacity.**

Those who grazed clovers for the first time are especially enthusiastic, because an abundance of feed is produced when Carpet and other pasture grasses are still dormant. It is well known that clovers are very high in feeding value, being approximately four times as high in calcium, twice as high in phosphorous, and two and one-half times as high in protein as Carpet grass. Because of the nutritious value of clovers, cattlemen are reporting a favorable influence on milk flow, growth, and

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# Indexing Potatoes Controls Diseases

*By J. F. Schinagl*

Wisconsin College of Agriculture, Madison, Wisconsin

POTATOES too can be "finger printed." Virus diseases, commonly called "running out," are detected by tuber finger printing, a system as unique and positive as that used in spotting human criminals. The offending members of the potato family are detected by forcing the plants in greenhouses and then discarding those tubers which harbor the disease.

Wisconsin seed stock, which represents one quarter of a million dollars in out-of-State trade for growers, is protected by this greenhouse procedure of getting rid of mosaic, spindle tuber, leaf roll, and spindle sprout infectious diseases. Since a 50 per cent infection will reduce yields by as much as 30 per cent, controlling potato disease is most important. Wisconsin ranks fifth in total production of all potatoes with an average harvest of 26,000,000 bushels. Maine ranks first, with Michigan, Minnesota, and New York following.

Potato tubers to be tested are numbered with an indelible pencil, explains J. W. Brann, potato specialist at the Wisconsin College of Agriculture, who is in charge of the tuber index method. Then an eye piece, containing the eye or bud from which the sprout develops, is cut from the tuber and numbered correspondingly. These eye pieces are planted in a "compost" soil which is a rich loam mixed with sand, turf, and manure. It is allowed to stand 2 or 3 years to bring about such high fertility.

Disease shows up, under regulated greenhouse conditions, when the plants reach heights of 8 to 10 inches in about 5 or 7 weeks. At this stage of growth, crinkling and mottling of the leaves clearly indicate the disease. Labels, bearing the same number as the eye piece and tuber, make it possible for the inspector to discard the diseased tubers from which the infected eye pieces came.

"Since the eye piece is an index as to the condition of the tuber, these yield-reducing diseases can be brought down to a very small percentage, and sometimes even to zero," Brann observes. "Actual planting of an eye piece is necessary because the tuber itself will not show any symptom of these diseases. Crinkling, rolling, and mottling reduce the leaf area, and so the food supply which is manufactured in the leaves to nourish and build the potato tubers is reduced, and yields are lessened as a result."

### Planting the Tubers

After indexing is completed at the University greenhouses, the healthy tubers are returned to the growers in the seed-growing sections of the State, and planted in tuber unit systems in isolated plots. Each tuber is cut into as many pieces as possible, and these pieces are then planted as one unit. Units are planted at least 3 feet apart to prevent error; after the plants come through, weak ones are "rogued" or pulled and then destroyed.

When the remaining healthy plants mature, the potatoes are dug, and in the

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# Portable Seed-cleaning Is Becoming Popular

*By C. E. Skiver*

Purdue University Agricultural Extension Service, Lafayette, Indiana

DELIVERING field seed-cleaning and treating service to corn-belt farmers had its inception in southwestern Indiana when the writer, after spending a long, tiresome day urging farmers to clean their own seed wheat, was crowded off the road by a truck delivering soda water. If other interests could profitably deliver soda water, sliced bread, and "what nots," why would it not be possible to deliver a seed-cleaning service that was so badly needed? Thus it was that the equipment to make the first portable seed cleaner to operate in this area was assembled in August of 1932. This unit, consisting of a large type fanning mill, a gas engine for a power unit, a receiving hopper, a sacker, and elevators and conveyers sufficient to make all operations automatic, was mounted on the platform of a 1½-ton truck.

At first it was necessary to solicit jobs, but as soon as growers had an opportunity to see the quality of work that was being done for a charge of only 3 cents per bushel, requests began to accumulate faster than they could be served. Before the season was well under way another fanning mill was borrowed, and a second improvised unit was assembled.

During this season the two crude units reached a total of 19,960 bushels of seed wheat, and had requests for nearly that much more which they

**Seed service delivered to the farm of William Kolb, Vanderburg County, Evansville, Indiana.**

were unable to get cleaned. Wheat prices were very low and ready money was hard to get a hold of, so the grower was given the option of paying in cash or marketable grain. Oftentimes the machines would come in at night with their day's earnings in bags on the fenders, or wherever they could be placed.

### Eliminated Corn Cockle

So popular was this type of service with the farmer, and so effective was it in bringing about the desired improvement, that three units were constructed for the 1933 season. As corn cockle was a serious weed in this section, and its complete separation with the fanning mill was almost impossible, disk separators were added to the new units. Because this improvement in the service was a rather expensive one, the price for cleaning was raised to 4 cents per bushel.

The publicizing and scheduling of the machines were done entirely through the offices of the county agricultural agents in the seven counties of southwestern Indiana, where the machines operated. During this second year the units cleaned 59,156 bushels of seed wheat, or nearly 20,000 bushels per machine, and again were not able to meet all the requests for their services.

During the first two seasons' operations, stinking smut was found to be serious in several communities. To meet this difficulty, automatic treaters that would treat the grain as it was discharged from the cleaners were designed. At first copper carbonate was used as a disinfectant dust, but this was later replaced by the mercury compound which proved more effective and more convenient to use. A supply of dust was carried on each machine at all times, and an additional charge of 3 cents per bushel was made when the grower chose to have his seed treated.

Since the meager introduction of this portable seed-improvement service into the corn belt in 1932, it has grown until there were 35 units operating in Indiana, 20 in Illinois, and one in Ohio in 1938. As the early development was in the wheat-producing area, they were at first used very largely for this crop, but of late have been used extensively for both soybeans and oats. As oat smut is a very serious factor in reducing yields, the service is already being widely used in the oat sections.

Many improvements have been made in the equipment since the service was started. The assembly is now made on a special body that fits any standard 1½-ton truck chassis. It can easily be mounted on the truck when in use or removed if the truck is needed for other purposes. The over-all height has been reduced to about 9 feet 4 inches when mounted, which permits the operator to get into sheds and driveways, and does away with much of the heavy work of carrying the grain to and from the machine. All conveyers have been so constructed that they can be thoroughly cleaned after each job, thus eliminating the danger of mixing seed stocks or carrying noxious weeds from one farm to the next.

### Additional Improvements

An accurate dust feed has been designed to feed the proper amount of disinfectant dust into the grain stream before it enters the rotating drum where it is thoroughly mixed with the seed. A measuring device to register the amount of grain cleaned for each customer has been placed in the grain line just below the intake. Conveyers have been so arranged that the grain line may be shunted around the cockle machine when this separation is not needed.

As is generally the case, no custom or method of operation is readily adopted by farmers unless it has distinct advantages or merit. The portable cleaner and treater offers the farmer the services of cleaning and treating equipment he cannot afford to own. This service is given at his own granary door at a very reasonable rate made

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Response of clover to lime, phosphorus, and potash. Check at left. Second, P and K. Third, L, P, and K. Fourth, L and P. Fifth, L and K. Without lime little growth is made. Phosphorus and potash with lime produce best growth. Potash on this unmanured soil improved the growth made over and above that made by phosphorus and lime.

# Some Fundamentals Of Soil Management

*By A. F. Gustafson*

Professor of Soil Technology, New York State College of Agriculture, Ithaca, New York

ADVANTAGES might attend a partial return to the older fundamentals of soil management, although many of the newer concepts of soils are of great practical value. In fact, it is some of the newer methods, including the use of the microscope, that have redirected attention to the older ideas. The beneficial effect on the physical condition of the soil, brought about by some of the products of the decay of organic matter, is a case in point.

Up to about 1915 to 1918 soilsmen rather generally had believed implicitly that organic matter did somehow aid in bringing about granulation of heavy soils, and that percolation, aeration, and tilth were improved by additions of organic matter, and that granulation had a distinct tendency to check washing of the soil. This view was held by Masier and many other soil physicists in his day.

Then followed a period of nearly 2 decades in which prominent soilsmen believed strongly that the principal, if not the only, value of organic matter in the soil lay in its content of nitrogen. It has now been shown conclusively, however, that the products of the decomposition of organic matter help to bring about the formation of aggregates or granules in fine grained soils. Baver, Jenny, Stauffer, Browning and others now measure the size and determine the stability of the soil aggregates. Adding organic matter, they have found, increases the proportion of

the soil present as the larger granules, and, moreover, increases the stability of these granules.

Water percolates readily through a granular surface soil. Beating rains have relatively little effect on the stable granules, but readily bring unstable ones and separate particles into suspension. In this condition they may, of course, be easily carried away and thus lost from our fields. The effect of organic matter, or its decomposition products, is to reduce soil washing both by improving the percolation and absorption of water and by stabilizing the aggregates.

### The Need for Nutrients

For this purpose then as well as supplying nitrogen to crops, definite plans need to be developed for making liberal, regular returns of active organic matter to the soil. This holds for most arable, humid soils that have been under cultivation for a century or more. The more important means of returning organic matter are in the form of farm manures, green manures, cover crops, and crop residues.

Moreover, soils generally are deficient in phosphorus in the humid part of this country. To this the Bluegrass region is, of course, an exception. The only known way to overcome this deficiency of phosphorus is to purchase this element in any of the regular commercial carriers and to put it back into the soil. This return of phosphorus is essential because milk, eggs, fruits, vegetables, meats all carry phosphorus and other mineral elements away from the farm. Except as supplied in part by fertilizers, this mineral material came from the soil and is seldom, if ever, returned to the soil whence it came.

This mineral material includes potassium, calcium, magnesium, boron, zinc, copper, and manganese. Unless manure is applied to the soil a shortage of these latter four, the so-called trace elements, may develop. In fact, such deficiencies have already been recognized in various areas for a number of crops. As a result they are now being added somewhat generally to fertilizers. It appears probable that they should not be used unless deficiencies of them are known to exist.

Potash should be used wherever its application is profitable. Crops on peaty, sandy, and gravelly soils rather generally need this material. Then too, timbered soils that do not receive manure regularly often become deficient in available potash. The immense recoveries of potash that might be made from alcohol wastes, cement kiln, and flue dusts, and the supplies available from Searles Lake and from the underground deposits in New Mexico and foreign countries may well be drawn upon for the benefit of our crops.

For a time during the World War potash all but disappeared from fertilizers owing to our dependence on foreign supplies at that time. Because of the discovery of the rich underground deposits in New Mexico and their development, together with that of Searles Lake and of by-product potash, this country now is, or can easily be, entirely independent of foreign supplies of potash. This is a fortunate situation in the present political state of the world.

### Maintain Rather Than Restore

As a rule it appears to be more economical to maintain the productivity of our lands than to restore productivity, once the soil has become depleted of both plant nutrients and organic matter. Heavy losses of both nutrients and organic matter result from washing on sloping, arable lands, and in addition there are the unavoidable losses by leaching.

Maintenance of high but economic production aids greatly in the protection of the soil against erosion. Well-nourished, large, thrifty crop plants protect the soil from beating rains more completely than do small, unthrifty ones. The larger plants leave more residues that may be returned as organic matter to the soil than do smaller

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# The Use of Potash On Idaho Soils

*By H. W. E. Larson*

Soil Specialist, Idaho Agricultural Extension Service, Moscow, Idaho

GREAT variation in climate and soils is a distinctive characteristic of Idaho. Soils vary from peats and mucks in the northern counties of the panhandle to the Aeolian desert soils in and bordering the Snake River plain and the Columbia River plateau, except locally along river flood plains.

Annual rainfall in the crop-producing areas varies from less than 7 inches in the southern desert districts to over 40 inches in some of the mountain valleys of the north.

The wind-deposited soils in southern Idaho are derived mostly from rhyolithic rocks and their ash, together with the products of weathering of granitic rocks of the Idaho batholith which contain a relatively large percentage of potash. The wind-deposited soils in the north have been derived from eroded glacial granitic and metamorphic rocks which are notably rich in potash. The underlying basaltic lava is low in potash, but it has weathered only slightly. Also, it has been so deeply buried by the aeolian deposits, that it has affected the fertility of the surface soil very little.[1]

Another factor that has affected the use of potash in Idaho is that the largest

[1] Private communication from Alfred L. Anderson, Professor and acting Head of Geology Department, University of Idaho, Moscow, Idaho.

**Potash improved onion quality in a demonstration near Wilder, Canyon County, Idaho. It tended to prevent the formation of seed stalks and made the onions more firm and more desirable in shape.**

acreage of crops which might respond to potash fertilization is on irrigated desert soil. Since very little leaching had taken place on these soils previous to the beginning of irrigated farming some 40 to 60 years ago, the potash supply has been conserved for present crop use.

**Potash and phosphate are a good combination on high organic matter soils. A heavy application of farm manure had been applied to this field the previous year.**

The response obtained from the application of potash has been closely associated with such factors as the soil type, the crop, management practices, and the season.

Potash gives good response on organic soils. Excellent response has been obtained from the use of complete fertilizers on peat and muck soils. Most farmers use those having a high proportion of potash and phosphate. Results of past experiments and demonstrations have shown that very poor yields are obtained by the application of only nitrogen and phosphate on muck soils.

Fertilizer demonstrations have been conducted on peat and muck soils at various times during the past 15 years. Table 1 shows the results of a demonstration on peat soil in Bonner County using oat hay as the test crop. This demonstration illustrates several points as confirmed by other demonstrations under supervision of the extension service or conducted by farmers themselves. First, that a complete fertilizer is necessary for maximum production, and second, that the application of only phosphate or only potash does not produce profitable increased yields. Considerable residual effect from complete

TABLE 1.—RESULTS OF OAT HAY FERTILIZER DEMONSTRATION ON PEAT SOIL

| Treatment | Per Acre Pounds | Increase Due to Treatment Per Cent |
|---|---|---|
| Average of 5 checks... | 2,010 | ..... |
| 100# TSP..... | 1,934 | −3.8 |
| 100# $K_2SO_4$..... | 2,175 | 8.2 |
| 200# (0–22.5–25)..... | 2,055 | 2.2 |
| 300# (6.6–15–17)..... | 3,020 | 50.2 |
| 300# (0–15–35)..... | 2,540 | 26.4 |
| 300# (0–30–17)..... | 2,052 | 2.1 |
| 400# (0–22.5–25)..... | 2,052 | 2.1 |
| 600# (6.6–15–17)..... | 3,020 | 50.2 |
| 2,000# Limestone..... | 1,934 | −3.8 |
| 200# (0–22.5–25).....<br>Plus 2,000# Limestone | 2,420 | 20.4 |

fertilizer applications has been obtained the second and third years after applications were made. The application of limestone does not appear to be necessary on Idaho peat soils, which are only slightly alkaline in reaction.

TABLE 2.—RESULTS OF FERTILIZER DEMONSTRATION IN ALSIKE CLOVER-TIMOTHY FIELD ON MUCK SOIL IN BENEWAH COUNTY

| Treatment | Yield per Acre For one cutting | |
|---|---|---|
| | Tons | Inc. % |
| Check | 2.5 | ..... |
| 200# Gypsum | 2.6 | 4.0 |
| 350# (5–15–5) | 3.3 | 32.0 |
| Check | 2.5 | ..... |
| 200# TSP | 2.6 | 4.0 |
| 150# (3–20–20) | 3.3 | 32.0 |
| Check | 2.5 | ..... |

Table 2 presents evidence that significant increases can be obtained on peat soils where complete fertilizers having a wide variation in the ratio of their ingredients are used. Alsike clover and timothy mixed seeding was used as the test crop. The cost of the second complete fertilizer application was about $2 less than the cost of the first complete application. Gypsum and soluble phosphate applications produced only small increased yields of hay. However, potatoes grown on peat or muck soils have shown consistent, profitable response to complete fertilizers containing high amounts of potash.

Demonstrations in which potash and complete fertilizer treatments were included have also been conducted on the mineral soils in the cut-over areas. In some instances, response has been obtained one year in a field and not the following year or the preceding year as the case may be. Experiments with various fertilizer materials have been conducted at the Sandpoint Branch Station for several years. Results obtained in 1937 are presented in tables 3 and 4 and illustrate the point that crops may vary widely in their response to fertilizer treatment and that potash most frequently increases yields when applied in combination with phosphate and nitrogen. Crested wheat grass responded most markedly to the application of complete fertilizers, followed by the application of manure when only hay yields were recorded.

As shown in table 4, legumes respond best to the application of sulphur-containing materials on cut-over lands. Barley, a non-legume, (table 5) showed greatest response to the application of nitrogen and potash and showed little if any response to gypsum applications.

TABLE 3.—RESULTS OBTAINED IN FERTILIZER DEMONSTRATION CONDUCTED ON CRESTED WHEAT GRASS AT THE SANDPOINT BRANCH STATION*

| Treatment | Rate | Seed Yield | | Hay Yield | |
|---|---|---|---|---|---|
| | | Per Acre | Increase | Per Acre | Increase |
| | | *Lb.* | % | *Lb.* | % |
| Check (average of 2) | ..... | 467 | ..... | 2,265 | ..... |
| N | 150# $(NH_4)_2SO_4$ | 586 | 25 | 2,864 | 26 |
| P | 200# treble | 521 | 15 | 2,495 | 10 |
| K | 150# KCL | 477 | 2 | 2,647 | 17 |
| NPK | Same as above | 694 | 49 | 3,407 | 50 |
| Manure | 10 T | 456 | −2 | 2,951 | 30 |

* Annual report of the University of Idaho Branch Station at Sandpoint, 1937.

Variable responses from potash fertilizer applications in the southern Idaho irrigated sections have been observed and are probably due to the wide variation in soil and crops grown. Sandy soils have responded only slightly more consistently to potash-containing materials than have silt loams and clay loams. Southwestern Idaho has shown more response to potash application than any other irrigated section.

TABLE 4.—RESULTS OBTAINED IN 1937 FROM FERTILIZER APPLICATIONS MADE TO ALFALFA AT THE SANDPOINT BRANCH STATION.*

| Treatment | Yield | |
|---|---|---|
| | Per Acre | Increase |
| | *Tons* | % |
| Check Average | 5.33 | ..... |
| $NaNO_3$ | 5.96 | 12 |
| $(NH_4)_2SO_4$ | 7.14 | 34 |
| P | 5.80 | 9 |
| K | 5.86 | 10 |
| NP | 5.65 | 6 |
| NK | 5.44 | 2 |
| PK | 5.49 | 3 |
| NPK | 6.13 | 15 |
| Gypsum | 7.14 | 34 |
| Manure | 6.18 | 16 |

* Annual report of the University of Idaho Branch Station at Sandpoint, Idaho, 1937.

Leafy truck crops, such as lettuce, celery, and cabbage have shown most consistent response to the application of potash-containing fertilizers. The quality of onions is improved by potash application. Buyers purchasing for storage want onions which are grown on soils which have received potash and phosphate applications. Three of the main general crops, namely, alfalfa, beets, and potatoes have shown the least response.

A cooperator in Canyon County applied ammonium sulphate, soluble phosphate, and potassium sulphate to respective plats in his fall lettuce field. The lettuce heads on the potash-treated plat matured 2 weeks earlier than they did on the phosphate-treated plat. The heads on the potash-treated plat were very firm and were graded by the produce buyer as the best he had purchased in the community. Consequently, this lettuce commanded a premium price per crate, because of both quality and earliness of maturity. Lettuce heads from the phosphate-treated plat were of fair quality. No heads matured in the plat which had received nitrogen alone during 4 weeks following the first cutting of the potash-treated plat. Radish seed was grown in this field in 1938, and the largest yield of seed was produced on the phosphate-treated plat.

### Potash Improved Quality

Onion quality was improved by the application of potash as shown in a demonstration near Wilder, Canyon County. Results are presented in table 6. The potash application tended to prevent the formation of seed stalks, at the same time making the onions more firm and more desirable in shape, thereby producing a higher grade onion. Potash and phosphate are a good combination on high organic matter soils. A heavy application of farm manure had been applied to this field the previous year.

Figures 1 and 2 give some indication of the yield and also the method used in grading the produce from the various plats. The local government inspector graded samples from the various plats. The application of phosphate stimulates the production of truck crop seed, which has been demonstrated numerous times. In this field the phosphate-treated plants had the highest number of seed stalks.

Many of the fertilizer demonstrations conducted in southern Idaho during the past 3 years have included the application of potash together with phosphate, using alfalfa, beets, peas, and potatoes as test crops. Only a few of these demonstrations have included the application of potash alone, since experi-

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# Minor Element Fertilization *of* Horticultural Crops

*By F. S. Jamison*

Truck Horticulturist, University of Florida, Gainesville, Florida

THE thought has been expressed by many that deficiencies are becoming more acute, and they associate this fact with the fact that the fertilizing materials are more concentrated, contain fewer organic materials, and that many of the synthetic materials now used have fewer impurities than materials formerly used. It is interesting to note that there is a slide in the Vegetable Crops Department of Cornell University, taken more than 25 years ago, of what we now recognize as boron deficiency and that Frenching of citrus and pecan rosette have been reported in the literature for many years. It may be true that the use of fewer organics and higher quality fertilizers is increasing the acuteness of the trouble, but the troubles were here long before highly concentrated fertilizers of high quality materials were being used. However, undoubtedly the use of minor elements as a major fertilizer ingredient for certain crops and soil types will become a regular and uniform practice.

It would be impossible, in a paper of this nature, to attempt to review the literature that has appeared within the last decade on the fertilization of horticultural crops with manganese, magnesium, copper, zinc, and other elements which are apparently necessary in small amounts for the adequate nutrition of these crops. Furthermore, it is questionable, in my judgment, just how valuable a review of literature would be on a subject that is being so vigorously prosecuted by workers in many areas, so, as already intimated, this paper will not be a review of literature.

### A Few Recommendations

Another approach to a discussion of this subject would be simply to review the recommendations made by specific States for specific crops produced under particular soil conditions. Thus, for instance, in Florida it is recommended that 1 pound of zinc sulphate applied to tung-oil trees grown on certain soil types will prevent the occurrence of bronzing, a physiological disorder that ultimately results in the death of the plant. Celery growers are advised to apply "not more than 10 pounds an acre" of borax to prevent "crack stem" of celery. Growers producing crops on alkaline muck and marl soil are advised to apply 50 pounds of manganese sulphate to maintain the green color of the foliage usually associated with vigorous growth and an adequate food supply.

Pecan growers control pecan rosette by the application of zinc sulphate, white-bud of corn is prevented by the use of the same material, while citrus growers apply magnesium, manganese, copper, and zinc according to the char-

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# Animals Recognize Good Soil Treatment

*By Dr. Wm. A. Albrecht*

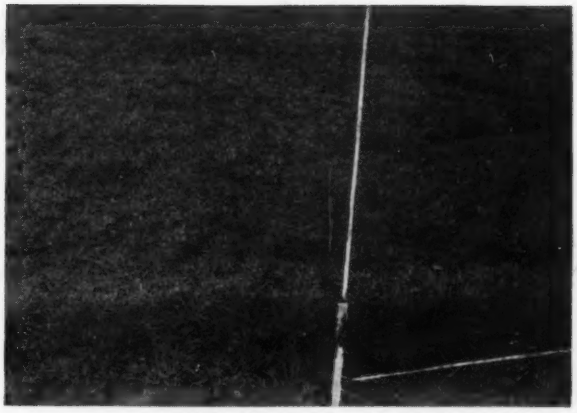
Chairman, Department of Soils, Missouri College of Agriculture, Columbia, Missouri

MEASURING the effects of lime and fertilizer additions to the soil only in terms of increased bushels or tons fails to give us the fullest evaluation of what such soil treatments are doing. If we will turn, however, to the animals that must eat the forage or the grain produced on the treated soils, we may discover that they point out by their tastes and choices some effects that we do not appreciate. Animals will recognize soil treatment effects too small to be recorded as weight differences, as well as improvements in the crop quality lasting long after the soil treatment may have been forgotten.

An illustration of this fine taste for improved soil fertility even in animals of supposedly depraved appetite is reported by Mr. Burk, the county extension agent of Johnson County, who cites the experience by Cliff Long. Last fall Mr. Long turned his hogs out to hog down some corn. This was on a field in the far corner of which, 80 rods distant from the gate where the hogs entered, limestone had been used on a small area some years ago. To Mr. Long's surprise, the animals went back and forth from the barn lot, the water, and the tankage supply at the gate, through about 80 rods of corn on unlimed soil to consume first the corn on the limed land.

**Hogs went through the unlimed part to select the limed part in hogging down the corn. Hogs know the soil fertility that makes the feed.**

"I don't believe it," you may say, but had you seen the hogs as Mr. Long and his neighbors saw both hogs and the field, you would no longer express doubt. You would take the testimony of these hogs about soil fertility even if the chemistry of the effects of limestone on the soil and on the corn plants may seem like only so much "hokus pokus" to you.



**Doubling the application of fertilizer on barley by drilling out this corner last fall enticed the cows to graze it this spring (left) and forego that with less fertilizer (right).**

As a further testimony, the cows on the farm of E. M. Poirot, Golden City, Missouri, declare their ability as connoisseurs of finer fertility differences reflected in the spring barley pasture. Mr. Poirot's barley was drilled last fall with an application per acre of 100 pounds of 32 per cent superphosphate through a tractor drill. This operation was carried out by drilling in "lands" and left the corners of the field rounded and partly undrilled during the main operation. In order to drill out these corners, a few rounds were made from the corners diagonally out into the field. This drilled a double dosage of the phosphate fertilizer over part of the field. In one of the drill rows in the main part of the field there was a very heavy application of fertilizer when a fertilizer gate remained open. This barley row was already much larger last fall.

This spring when the barley was pastured, these areas given the heavier application of 200 pounds of phosphate per acre were taken by the cattle first, and that part of the field given only 100 pounds was left ungrazed distinctly right to the drilling line. The one drill row in the main part of the field given extra heavy treatment by the open gate on the fertilizer drill was also singled out and taken first by the cattle.

Perhaps you may ascribe such discrimination to some other item than the fertilizer, but the cow knows her feed and can distinguish between difference in barley feed quality by soil treatments as small as hundred-pound applications of phosphate, as this report clearly demonstrates. Plants are sensitive with responses not recognized by the eye.

As a further illustration of the forage differences recognized by cattle, Mr. Poirot cites a case where the cattle selected a small area within 190 acres of virgin prairie pasture where 500 pounds of limestone per acre were drilled as a demonstration in 1928. He says, "The cattle have stayed on this smaller limed area this spring rather than graze over the entire 190 acres." Here in this virgin prairie, the addition of so small an amount as 500 pounds of limestone drilled but lightly into the surface has left an effect on the virgin, native forage which even the supposedly dumb beasts still can recognize after almost 11 years. It suggests that liming some of our older pasture by an early spring drilling that doesn't tear up the sod may make differences appreciated by the cow even if we don't recognize them.

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# More for the Money

*By Louis H. Wilson*

Editor, North Carolina Department of Agriculture, Raleigh, North Carolina

NORTH CAROLINA farmers received $515,211 worth of additional plant food in their fertilizers last season for which they did not pay a penny. This is the estimate of D. S. Coltrane, Assistant to Commissioner of Agriculture, who based his statement on the assumption that the plant-food content of 5,176 samples of fertilizer analyzed by the State Department of Agriculture is indicative of the fertilizer sold generally.

### Recommend Best Grades

His study of the 1938 average value of fertilizer sold reveals that manufacturers gave farmers an average of 52¢ per ton value in excess of plant food guaranteed. Sales reports indicate farmers purchased approximately 1,000,000 tons of fertilizer last Spring for which they paid approximately $25,000,000.

"It is significant that fertilizer manufacturers, generally, are more than meeting the guarantee listed on the fertilizer tag," Coltrane said. "But it is more significant that manufacturers are rendering an outstanding service for the farmers and the State by encouraging the purchase of recommended grades of fertilizer that can be bought by the farmer at a substantial saving."

For the past 16 months, the North Carolina Department of Agriculture has been active in promoting the use of high-analysis fertilizers in an effort to reduce the farmers' fertilizer bill.

"If farmers only purchase recommended grades of fertilizer, they can conservatively save from $1,500,000 to $2,000,000 a year," Coltrane emphasized.

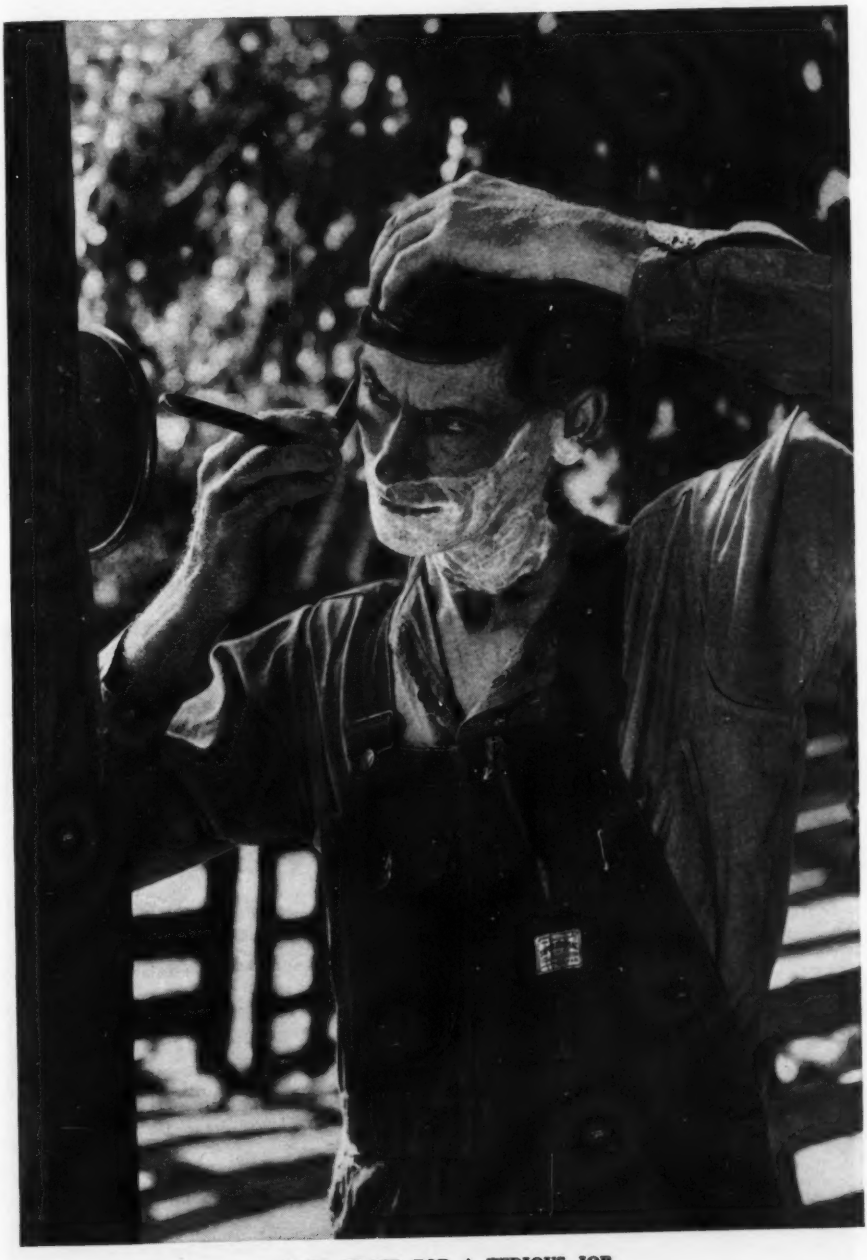
"North Carolina farmers are rapidly turning away from the poorer grades of fertilizer and are effecting a saving ranging from 9 to 12.5 per cent annually by purchasing higher analysis goods.

"Manufacturers know and farmers are rapidly learning that distribution costs, which include cost of bags, labor, taxes, freight, dealers' profits, sales costs, trucking to the farm, mixing, and a few other items, are practically the same per ton, which is about $12 regardless of the grade of fertilizer offered for sale," Coltrane said. "The cooperation of manufacturers, agricultural education agencies, and the Department in seeking to eliminate the low-analysis fertilizers is reflected in the reduction in sales of 3-8-3 fertilizer, a grade containing 14 units of plant food and 400 pounds of sand per ton if non-acid forming neutral.

### Use High-analysis Fertilizers

"While 3-8-3 (containing three parts nitrogen, eight parts phosphoric acid, and three parts potash) is not recommended for a single crop by the Experiment Station, a total of 46.71 per cent of the total fertilizer tonnage four years ago was of this grade. In 1937 the 3-8-3 represented 35.6 per cent of the tonnage, but last season sales were curbed 15 per cent. Growers, themselves, are making a rapid departure from unrecommended grades of goods, but until low-analysis fertilizers such as 3-8-3 are completely abandoned, the manufacturers, dealers, agronomists, and agricultural leaders have a worthwhile opportunity to continue a joint program that will further the use of high-analysis fertilizers at a substantial saving to the farmers."

# PICTORIAL



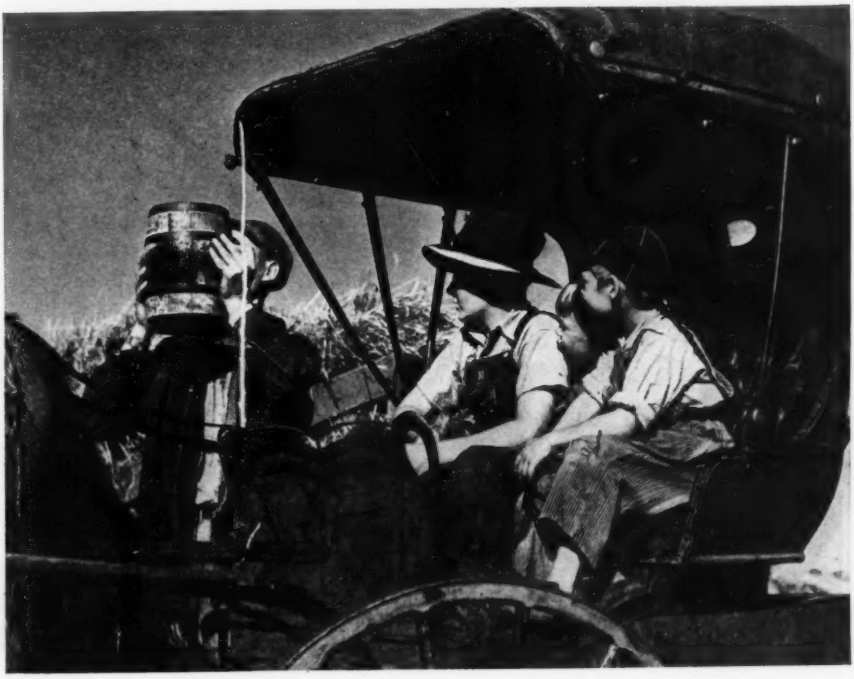
A COOL PLACE FOR A TEDIOUS JOB.

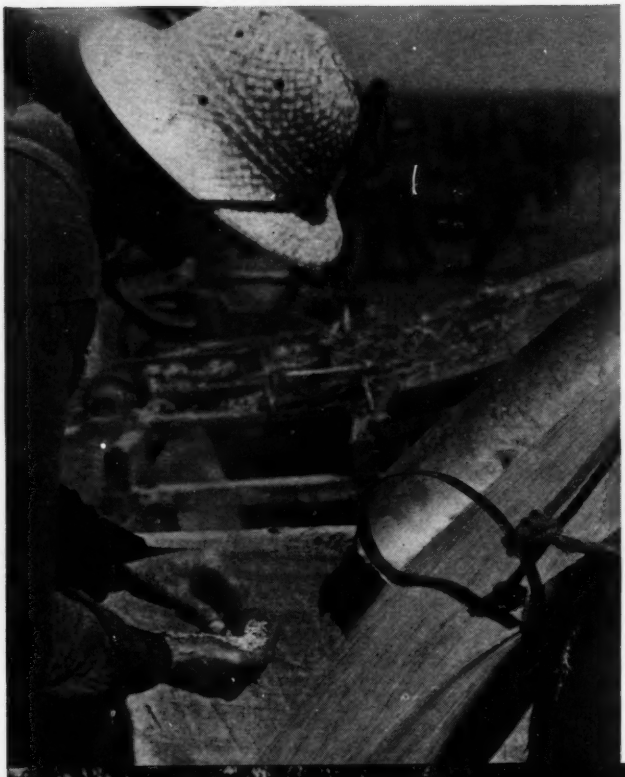
*Above:* **Fire in a wheat field is cause of alarm to the whole community.**

*Below:* **Threshers' appetites match farm women's pride in loaded tables.**

*Above:* Scenes like this satisfy faith in America's ability to produce.

*Below:* Children enjoy many useful tasks given them at harvest time.





*Left:* It is not only the yield, but the weight, that counts.

*Below:* A picnic will attract a good attendance anytime.

# The Editors Talk

## The Cotton Problem

Cotton is still the most important single crop in the South, and the large cotton crops produced during the last several years, together with unsettled business conditions and diminishing exports, have presented the Nation with a cotton problem. Much credit is due individuals and organizations attacking this problem and giving careful consideration to the countless opinions on its solutions. As in the case of any problem, some of the proposed solutions appear unsound, for instance, the idea of having a complete cotton-growing holiday for a season. Such a sudden disruption of the entire agricultural life in the South and the disturbances in labor relationships, both rural and urban, alone would produce economic and sociological problems that would dwarf that of the cotton surplus.

A sound solution of the cotton problem involves one of two possible courses or, more probably, a combination of them. Either production must be reduced, or consumption must be increased. Reduction in production beyond certain limits does not appear desirable or even feasible. Increase in consumption almost certainly means that the price must be low enough to attract buyers in foreign markets and to find new outlets both at home and abroad. Lower prices require lower production costs, if a margin of profit is to be left the grower. Growing cotton at a low cost per pound so as to leave a profit to the grower requires that the most efficient means be employed to produce the crop.

One of the first steps in such a program is confining the growing of cotton to those acres to which it is best adapted. The soil conservation program is making much progress in this direction. Growing improved and adapted varieties, good cultural practices, proper fertilization, insect control, proper harvesting, and good ginning all are important factors in producing cotton at a low cost. Added to this must be efficient marketing.

The cotton problem is by no means simple, nor is any solution likely to be easy of attainment, but that does not make it hopeless by any means. It is rather a challenge to our resourcefulness and ingenuity.

## Proper Fertilization

"It is becoming very apparent that many dairy farms in order to grow alfalfa and clover successfully—in fact, to get the best yields of grain,—require more fertilization than the fields have received. The little brown spots with a yellow fringe on the alfalfa leaves, or the yellow edge on the corn leaf, are indicative of a deficiency of potash.

"For many years it has been known that upland soils cropped for a long time are in need of phosphorus but it has been held until recently that they had an abundance of potash. In visiting certain fields of alfalfa this year, the little plants showed a lack of potash. Field demonstrations in the use of fertilizer carried on by the Wisconsin College of Agriculture, under the leadership of Professor C. J. Chapman, have shown repeatedly that by the use of fertilizer containing phosphorus and potash, the increased yield of grain has paid well for the fertilizer used and the hay crop following has also been larger. As Professor Chapman says: 'In all cases a net profit is shown from the fertilizer treatment where the combined value of the increase in grain in 1937 and hay in 1938 are added together. In fact, a net profit ranging from a low of $4.68 to a high of $33.39 per acre is shown. In all cases where a comparison has been made of 20 per cent superphosphate and 0-20-10 in the residual carry-over benefit to the hay crop, we observe that the mixture carrying some potash in addition to phosphate gives the largest net return.' "—*Editorial, Hoard's Dairyman, August* 25, 1939.

# Plant Injections

To a great many people the idea of injecting a plant with nutrients to forestall nutrient deficiencies would seem new and revolutionary. It is of great interest, therefore, that a relatively recent publication—"Plant Injection for Diagnostic and Curative Purposes," Technical Communication No. 10, Imperial Bureau of Horticulture and Plantation Crops, East Malling, Kent, England, October 1938,—reviews all past work on the subject and speculates on the importance such a practice may some day assume in profitable agriculture.

According to the author, Dr. W. A. Roach, tree injection has been practised since very early times, the first reference going back to Arab sources in the twelfth century. In this reference methods for imparting perfumes, flavors, and medicinal qualities to fruits, and a yellow or blue color to roses, were described. In the fifteenth century Leonardo da Vinci described injecting trees to make the fruit poisonous. Much of the later work by research men of the various countries is cited, but the author points out that it is only of late years that the various injection methods have been used as a first, or an early, step in finding cures for a number of deficiency diseases, and the investigations concerned with this have been carried out along essentially similar lines in practically all countries.

In describing his own work, Dr. Roach reports on his seven years of study and experimentation. He has been credited with developing a precise technique which can be followed by others. In evaluating the work, Professor V. H. Blackman, Director of the Research Institute of Plant Physiology, Imperial College of Science and Technology, London, states that to the horticulturist the injection method is unrivalled in the speed with which in some cases the conditions of deficiency may be elucidated; a diagnosis may even be available in a few days. For remedial measures also the advantages are plain. The curative substances can be used without the loss, alteration or delay in action so often found with applications to the soil. The plant physiologist, the experimenter in horticulture, and the fruit-grower are thus all in debt to the East Malling Research Station for the important development of its work.

# REVIEWS

**This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.**

## Fertilizers

¶ In certain parts of the South, the rapidity of cotton fruiting is a factor in lowering the damage from boll-weevils. To determine the effect of fertilizers on the rate of cotton fruiting, H. B. Brown and H. W. Pope of the Louisiana Experiment Station conducted a fertilizer experiment involving the use of 92 plots and 24 treatments at the Station Farm, Baton Rouge. The results of their observations, as well as a review of the literature on the subject, have been presented in Louisiana Bulletin No. 306, "Effect of Nitrogen, Phosphorus, and Potassium in Fertilizers on the Earliness of Cotton." This publication undoubtedly will be welcomed by all groups concerned in beating the weevil and securing greater profit from cotton growing.

*"The Laws of Oregon Relating to the Department of Agriculture of the State of Oregon, Commercial Fertilizers and Lime, 1939," St. Dept. of Agr., Salem, Oreg., Pam. 3, 1939.*

*"Fertilizer Experiments with Cotton in the Gulf Coast Prairie of Texas," Agr. Exp. Sta., College Station, Tex., 515 Prog. Rp., April 18, 1938, E. B. Reynolds and R. H. Stansel.*

## Soils

¶ A practical example of localizing information for the grower is employed by A. W. Blair of the New Jersey Agricultural Experiment Station in his four-page Circular 383, "Maintaining Soil Fertility in South Jersey." The easy, conversational style which the author adopts for relaying his advice, together with its presentation in a larger size of print, should put the information within reach of a greater number of farmers. In speaking of fertilizers, Professor Blair points out the relation of fertilizer use to reduced labor costs: "Excepting the years 1931 and 1932 fertilizer can probably be bought today at about as low a figure as at any time since the war, whereas the price of labor is still high. Thus, fertilizers judiciously used to increase acre yields may actually cut labor costs."

*"The Soil Characteristics of Connecticut Land Types," Agr. Exp. Sta., New Haven, Conn., Bul. 423, May 1939, M. F. Morgan.*

*"The Effect of Degree of Base Saturation of Soils Upon the Fixation of Phosphate and Potassium and the Availability of Phosphorus," Agr. Exp. Sta., Newark, Del., Bul. 215, Tech. No. 22, Oct. 1938, G. M. Gilligan.*

*"Controlling Common Scab of the Potato on Long Island by the Addition of Mercury Compounds to the Fertilizer Mixture and the Relation of Soil Reaction to the Treatment," Agr. Exp. Sta., Geneva, N. Y., Bul. 685, April 1939, H. S. Cunningham and P. H. Wessels.*

*"Soil Survey of Wheeler County, Nebraska," U. S. D. A., Washington, D. C., Series 1933, No. 5, 1937, Basil Abaskin and F. A. Hayes.*

*"Soil Survey, Colbert County, Alabama," U. S. D. A., Washington, D. C., Series 1933, No. 22, Feb. 1939, L. G. Brackeen and A. L. Gray.*

*"Erosion and Related Land Use Conditions on the Scantic River Watershed, Connecticut-Massachusetts," U. S. D. A., Washington, D. C., March 1939, P. H. Montgomery.*

*"Erosion and Related Land Use Conditions on the Watershed of White Rock Reservoir Near Dallas, Texas," U. S. D. A., Washington, D. C., Feb. 1939, Richard M. Marshall and Carl B. Brown.*

## Crops

¶ Annual reports of State Agricultural Experiment Stations, Colleges, and Departments of Agriculture are always sources of much varied information of interest to anyone connected with agriculture. Among the listings below can be found reports from Arkansas, Cali-

fornia, Connecticut, Delaware, Florida, Hawaii, Indiana, Kentucky, Massachusetts, and Michigan. In such a range of territory, information touching on problems peculiar to more localized sections is sure to be obtainable.

*"Certain Ecological Factors and the Cotton Plant," Agr. Exp. Sta., Fayetteville, Ark., Bul. 376, May 1939, Burt Johnson and Cecil H. Wadleigh.*

*"Summary of Important Research Work with Rice, 1927-1938," Agr. Exp. Sta., Fayetteville, Ark., March 1939.*

*"Nineteenth Annual Report, California Department of Agriculture for the Period Ending December 31, 1938," St. Dept. of Agr., Sacramento, Calif., Vol. XXVII, No. 6, Dec. 1938.*

*"Bulletin of the Department of Agriculture, State of California," St. Dept. of Agr., Sacramento, Calif., Vol. XXVIII, No. 4, April 1939.*

*"Annual Report for the Year Ending October 31, 1938," Agr. Exp. Sta., New Haven, Conn., Bul. 421, April 1939.*

*"Annual Report of the Director for the Fiscal Year Ending June 30, 1938," Agr. Exp. Sta., Newark, Del., Bul. 214, Nov. 1938.*

*"1938 Report Cooperative Extension Work in Agriculture and Home Economics, Report of General Activities for 1938 with Financial Statement for the Fiscal Year Ended June 30, 1938," Agr. Ext. Serv., Gainesville, Fla.*

*"Roses in Florida," Agr. Ext. Serv., Gainesville, Fla., Bul. 102 (Bul. 78 revised), May 1939, G. H. Blackmon, J. V. Watkins, and W. L. Floyd.*

*"Report of the Hawaii Agricultural Experiment Station, 1938," Agr. Exp. Sta., Honolulu, T. H., May 1939.*

*"Grasses of the Hawaiian Ranges," Agr. Exp. Sta., Honolulu, T. H., Bul. 82, May 1939, L. D. Whitney, E. Y. Hosaka, and J. C. Ripperton.*

*"Report of the Director for the Year Ending June 30, 1938," Agr. Exp. Sta., Lafayette, Ind., J. H. Skinner, Dir., and H. J. Reed, Asst. Dir.*

*"Jennings County Experiment Field, Report of Progress, 1921-1938," Agr. Exp. Sta., Lafayette, Ind., Cir. 244, May 1939, A. T. Wiancko, G. P. Walker, and Charles Robbins.*

*"Growth and Flowering of the Gladiolus, Influence of Certain Morphological and Physiological Characteristics of the Corms," Agr. Exp. Sta., Ames, Iowa, Res. Bul. 253, Mar. 1939, L. C. Grove.*

*"Curing and Storage of Alfalfa Hay," Agr. Exp. Sta., Ames, Iowa, Res. Bul. 251, Feb. 1939, Edwin R. Henson.*

*"Agricultural Experiment Station of the University of Kentucky, Fifty-first Annual Report for the Year 1938, Part 1, Report of the Director," Agr. Exp. Sta., Lexington, Ky., Thomas P. Cooper, Dir.*

*"Improving Beef Cattle Pastures on Rice Lands," Agr. Exp. Sta., University, La., Bul. 305, Mar. 1939, Chas. I. Bray.*

*"The Home Garden in Maine," Agr. Ext. Serv., Orono, Maine, Bul. 262, June 1939, George F. Warren, Jr.*

*"Annual Report for the Fiscal Year Ending November 30, 1938," Agr. Exp. Sta., Amherst, Mass., Bul. 355, Feb. 1939.*

*"Landscaping the Home Grounds," Agr. Ext. Serv., East Lansing, Mich., Ext. Bul. 199, May 1939, C. P. Halligan.*

*"Formulas for Finding Estimates for Two and Three Missing Plots in Randomized Block Layouts," Agr. Exp. Sta., East Lansing, Mich., Tech. Bul. 165, April 1939, William Dowell Baten.*

*"Seventy-seventh Annual Report of the Secretary of the State Board of Agriculture and Fifty-first Annual Report of the Experiment Station from July 1, 1937 to June 30, 1938," St. Bd. of Agr., Lansing, Mich., 1938.*

*"Hay-crop Silages," Agr. Ext. Serv., Universtiy Farm, St. Paul, Minn., Ext. Folder 72, May 1939, H. R. Searles.*

*"Nutritive Value and Chemical Composition of Certain Fresh-water Plants of Minnesota," Agr. Exp. Sta., Univ. Farm, St. Paul, Minn., Tech. Bul. 136, Mar. 1939, J. Wesley Nelson, Leroy S. Palmer, Arne N. Wick, W. M. Sandstrom, and H. V. Lindstrom.*

*"Growing Sweetpotatoes in the Yazoo-Mississippi Delta," Agr. Exp. Sta., State College, Miss., Bul. 327, April 1939, E. A. Currey.*

*"Mississippi Farm Research," Agr. Exp. Sta., State College, Miss., Vol. 2, No. 6, The Director's Annual Report: Part 3, June 1939.*

*"Crotalaria," Agr. Exp. Sta., State College, Miss., Inform. Sh. 167, Feb. 1939.*

*"Establishing the Orchard," Agr. Exp. Sta., Columbia, Mo., Cir. 202, Mar. 1939, T. J. Talbert.*

*"Suggestions to Tomato Growers," Agr. Exp. Sta., New Brunswick, N. J., Cir. 391, Mar. 1939, J. S. Joffe and V. A. Tiedjens.*

*"Grass Silage, Its Place in Agriculture, How to Make It—How to Feed It," Agr. Exp. Sta., New Brunswick, N. J., Cir. 386, Mar. 1939, C. B. Bender and E. S. Savage.*

*"Timothy Culture," Agr. Exp. Sta., Wooster, Ohio, Bul. 603, May 1939, Morgan W. Evans, F. A. Welton ,and Robt. M. Salter.*

*"Resultado de un Estudio de las Practicas Agricolas Usadas en 398 Fincas de Cafe en Puerto Rico," Estación Experimental Agrícola, Río Piedras, P. R., Boletin 49, Mayo 1939, J. Guiscafré Arrillaga and Luis A. Gómez.*

*"Wilt-resistant Cotton," Agr. Exp. Sta., College Station, Tex., 604 Prog. Rpt., May 5, 1939, P. A. Young.*

*"Tests of Corn Varieties and Hybrids in Utah," U. S. D. A., Washington, D. C., Bul. 287, May 1939, R. W. Woodward, D. C. Tingey, and R. J. Evans.*

*"Mushroom Casing Soil in Relation to Yield," U. S. D. A., Washington, D. C., Cir.*

*509, May 1939, Edmund B. Lambert and Harry Humfeld.*

*"New Chrysanthemums," U. S. D. A., Washington, D. C., Cir. 528, May 1939, Furman Lloyd Mulford.*

*"Sugar-beet Culture in the Humid Area of the United States," U. S. D. A., Washington, D. C., Farmers' Bul. 1637, Revised April 1939, J. G. Lill.*

*"Seed Corn," U. S. D. A., Washington, D. C., Farmers' Bul. 1822, April 1939, Merle T. Jenkins.*

*"The Timothy Crop," U. S. D. A., Washington, D. C., Leaf. 171, Feb. 1939, Morgan W. Evans.*

*"The Native Papaw," U. S. D. A., Washington, D. C., Leaf. 179, Feb. 1939, H. P. Gould.*

*"Sewage Irrigation as Practiced in the Western States," U. S. D. A., Washington, D. C., Tech. Bul. 675, Mar. 1939, Wells A. Hutchins.*

**Economics**

¶ Fertilizer sales in North Carolina during the last half, July-December, 1938, amounted to 81,220 tons according to the mimeographed report by the North Carolina Department of Agriculture (Fertilizer Sales by Grade in Order of Tonnage).

The leading mixtures sold during the period were 3-8-3, 2-10-6, 4-8-3, 0-10-4, 4-8-4, 2-9-3, 2-10-4, 0-10-6, and 5-7-5. In addition to the 61,654 tons of mixed fertilizers sold, sales of fertilizer materials amounted to 19,566 tons. Nitrogenous materials amounted to 6,311 tons, phosphatic materials 12,315 tons, potassic materials 617 tons, and customers' mixtures 323 tons.

According to Charles S. Cathcart in his New Jersey Bulletin 662, "Analyses of Commercial Fertilizers and Ground Bone; Analyses of Agricultural Lime, 1938," the total tonnage of fertilizers sold in the State amounted to 171,721 tons in 1938. The average composition of fertilizers sold in New Jersey during 1938 was 4.42% nitrogen, 10.41% phosphoric acid, and 7.56% potash with an average selling price of $31.52. This compares to 3.37% nitrogen, 9.49% phosphoric acid, and 6.27% potash with a selling price of $36.32 in 1929. There has been a gradual increase in the nitrogen and potash contents in New Jersey fertilizer and an erratic increase in phosphoric acid.

The Department of Agricultural Economics of Rutgers University has recently published an interesting mimeographed report entitled "Farm Business Study of 25 Specialized Vegetable Farms in Monmouth County, New Jersey, 1937." The publication was prepared by J. W. Carncross, Allen G. Waller, and Charles Messer. According to Table 1, total acres operated per farm were 112 with 85 acres of crop land. The real estate investment amounted to an average of $14,840, and livestock was only $473 with $3,544 invested in machinery. Crop sales averaged $6,906 and sales of livestock and miscellaneous items brought the total to $7,203. Total expenses averaged $7,206 or an average loss per farm of $3. The expenses included $2,314 for labor, $1,057 for fertilizer, $550 for containers, $439 for fuel and oil, and $340 for seed. Taxes, insurance, and other expenses, including repairs on buildings and equipment made up the balance.

*"Division of Chemistry, Annual Report for the Calendar Year 1938," Dept. of Agr., Sacramento, Calif., Vol. XXVII, No. 6, Dec. 1938, Dr. Alvin J. Cox, Chief.*

*"Classified Commercial Fertilizer Sales as Reported to Date for the Quarter Ended March 31, 1939," St. Dept. of Agr., Sacramento, Calif., Announcement 32, June 28, 1939, Dr. Alvin J. Cox, Chief.*

*"Monthly Bulletin of Agricultural Statistics," Dominion Bureau of Statistics, Agr. Branch, Ottawa, Ontario, Canada, Vol. 32, No. 367, Mar. 1939, R. H. Coats, Dom. Statistician.*

*"Economic Digest for Connecticut Agriculture," Agr. Ext. Serv., Storrs, Conn., No. 76, May 1939.*

*"Statistical Information Pertaining to the Marketing of Agricultural Products in Connecticut, 1938," St. Dept. of Agr., Hartford, Conn., June 1939.*

*"Quarterly Bulletin, State Board of Agriculture, State Laboratory, Fertilizer, Lime, and Seed Report, July-December, 1938, Miscellaneous January-December, 1938, Issued for Quarter Ending December 31, 1938," St. Bd. of Agr., Dover, Del., Vol. 28, No. 4, 1939.*

*"Consumption of Mixed Fertilizers by Counties of Florida for Month of May, 1939, as Reported by Manufacturers," Com. of Agr., Tallahassee, Fla., Nathan Mayo, Com.*

*"Consumption of Fertilizer Materials by Counties of Florida for Month of May, 1939, as Reported by Manufacturers," Com. of Agr., Tallahassee, Fla., Nathan Mayo, Com.*

*"Farm Buildings in Relation to Farm Man-*

*agement in Indiana," Agr. Exp. Sta., Lafayette, Ind., Bul. 435, Mar. 1939, Lynn Robertson.*

*"Economic Study of Harvesting with the Small Combine in Indiana," Agr. Exp. Sta., Lafayette, Ind., Bul. 436, April 1939, J. C. Bottum, W. R. Rothenberger, and I. D. Mayer.*

*"The Cost of Using Farm Machinery in Indiana," Agr. Exp. Sta., Lafayette, Ind., Bul. 437, May 1939, E. L. Butz and O. G. Lloyd.*

*"Indiana Crops and Livestock," Agr. Exp. Sta., West Lafayette, Ind., No. 165, June 1, 1939, Robert E. Straszheim and Miner M. Justin.*

*"Farm Economic Facts," Agr. Ext. Serv., Amherst, Mass., Vol. XII, No. 6, June 1939.*

*"Crop Report for Michigan, June 1939," St. Dept. of Agr., Lansing, Mich., Verne H. Church and Cecil J. Borum.*

*"Farm Business Notes," Agr. Ext. Serv., University Farm, St. Paul, Minn., No. 198, June 1939.*

*"Farm Mortgage Loan Experience in Central Montana, A Study of the Important Factors Associated with Good or Bad Mortgage Loan Experience," Agr. Exp. Sta., Bozeman, Mont., Bul. 372, June 1939, Phil S. Eckert and Orlo H. Maughan.*

*"The Economic Situation Facing New Jersey Vegetable Growers," Agr. Exp. Sta., New Brunswick, N. J., Bul. 660, Mar. 1939, John W. Carncross and Allen G. Waller.*

*"Land Use in New York," Cornell Univ. Agr. Ext. Serv., Ithaca, N. Y., Bul. 406, April 1939, V. B. Hart.*

*"Quality of North Carolina Cotton 1928-1936," Agr. Exp. Sta., Raleigh, N. C., Bul. 323, May 1939, W. B. Lanham, Glenn R. Smith, and Ralph H. Raper.*

*"Ohio Agricultural Statistics, 1937," Agr. Exp. Sta., Wooster, Ohio, Bul. 602, Mar. 1939, Glen S. Ray, Oakley M. Frost, and P. P. Wallrabenstein.*

*"Department of Agriculture of Oregon Bulletin," St .Dept. of Agr., Salem, Oreg., No. 90, June 1939.*

*"Farm Practices and Management in Central Pennsylvania," Agr. Exp. Sta., State College, Penna., Bul. 379, May 1939, J. E. McCord.*

*"Department of Agriculture-Immigration of Virginia," St. Dept. of Agr., Richmond, Va., Buls. 371 & 372, June & July 1939.*

*"Fruit Trees in the Wenatchee-Okanogan District, Washington," Agr. Exp. Sta., Pullman, Wash., Bul. 369, Feb. 1939, Woodrow W. Rufener.*

*"Cooperative Purchasing in Washington," Agr. Exp. Sta., Pullman, Wash., Bul. 371, Mar. 1939, E. F. Dummeier.*

*"The Tobacco Industry in Puerto Rico," U. S. D. A., Washington, D. C., Cir. 519, Mar. 1939, Charles E. Gage.*

*"Origin and Distribution of the Commercial Potato Crop," U. S. D. A., Washington, D. C., Tech. Bul. 7, Revised April 1939, J. W. Strowbridge.*

*"How Agriculture, Industry, Labor, and Government Can Work Together for a $100,000,000,000 Income," U. S. D. A., Washington, D. C., G-95, May 1939.*

*"Regulations Pertaining to Cotton Marketing Quotas for the 1939-40 Marketing Year," U. S. D. A., AAA, Washington, D. C., Cotton 307, April 29, 1939.*

*"Marketing Agreement Regulating the Handling of Fresh Bartlett Pears, Plums, and Elberta Peaches Grown in the State of California," U. S. D. A., Washington, D. C., Marketing Agreement Series-Agree. 85, A-20, May 24, 1939.*

*"Marketing Agreement Regulating the Handling of Tomatoes Grown in the State of Mississippi," U. S. D. A., Washington, D. C., Marketing Agree. Ser., Agree. 86, A-21, May 31, 1939.*

*"Marketing Agreement Regulating the Handling of Beurre Hardy Pears Grown in the State of California," U. S. D. A., Washington, D. C., Marketing Agree. Ser., Agree. 87, A-22, June 16, 1939.*

*"Order Regulating the Handling of Fresh Bartlett Pears, Plums, and Elberta Peaches Grown in the State of California," U. S. D. A., Washington, D. C., Marketing Orders—Part 936, O-36, May 29, 1939.*

*"Order Regulating the Handling of Tomatoes Grown in the State of Mississippi," U. S. D. A., Washington, D. C., Marekting Orders—Part 937, O-37, June 5, 1939.*

*"Order Regulating the Handling of Beurre Hardy Pears Grown in the State of California," U. S. D. A., Washington, D. C., Marketing Orders—Part 938, O-38, June 16, 1939.*

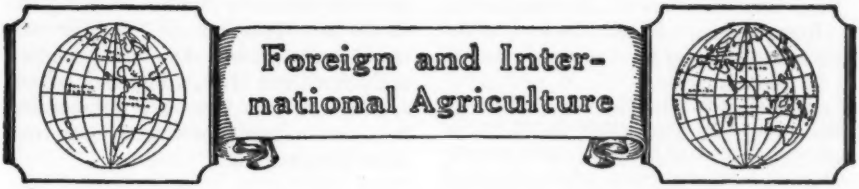
*"Determination of Farming Practices to be Carried out in Connection with the Production of Sugarcane During the Crop Year 1939-40 for Puerto Rico, Pursuant to the Sugar Act of 1937," U. S. D. A., Washington, D. C., S. D. 67, May 9, 1939.*

*"Determination of Farming Practices to be Carried out in Connection with the Production of the 1939 Crop of Sugarcane in the Mainland Cane Sugar Area, Pursuant to Subsection (e) of Section 301 of the Sugar Act of 1937," U. S. D. A., Washington, D. C., S. D. 68, May 10, 1939.*

*"Handling of Excess-quota Sugar in the Continental United States," U. S. D. A., Washington, D. C., G. S. R. Series 2, No. 5, May 24, 1939.*

*"Income Parity for Agriculture, Part III.—Prices Paid by Farmers for Commodities and Services, Section 5.—Index Numbers of Prices Paid by Farmers for Commodities 1910-38," U. S. D. A., AAA, Washington, D. C., May 1939.*

*"Car-lot Shipments of Fruits and Vegetables by Commodities, States, and Months (Including Boat Shipments Reduced to Car-lot Equivalents), Calendar Year 1938," U. S. D. A., Washington, D. C., Mar 1939.*




**To supply information on agricultural research in other countries, titles and a few descriptive remarks of principal articles in the two magazines "Die Ernährung der Pflanze," published in Berlin, Germany, and "La Potasse," published in Mulhouse, France, are given here. Due to space limitation, only articles of general fundamental interest are given, although both magazines contain other articles of local interest and abstracts of outstanding articles in other publications.**

## *Die Ernährung der Pflanze, June 1939, Vol. 35, No. 6*

A Soil Map of Germany. *By H. Stremme, Danzig.*

Soil scientists of Europe are cooperating in the preparation of a unified soil map of Europe, and this map of Germany is a unit of the larger continental map. Dr. Stremme states that the basis of the map is biogenetic, giving consideration to vegetation relief, water, rock, and cultivation as factors in soil formation. The term vegetation is broadened to include effects of animal and microbiological life. Five principal groups of soils are recognized, based on the factors mentioned. These groups are termed vegetation soils, wet soils, rock soils, hilly soils, and artificial soils. The subdivisions within these groups and within intermediate groups are given diagrammatically. A discussion of the groups and descriptions of soils, together with a comparison of this classification system to that used in North America clearly explains the basis of European soil mapping.

Saxony, an Excellent Field for Soil Research. *By F. Kertscher, Dresden, Germany.*

This is mainly a discussion of the development of a soil-testing service in Saxony. The Neubauer method is used to test the soils, the experiment station in Dresden testing some 25,000 soil samples a year. Dr. Neubauer, who is director of this experiment station states that the great variability of the soils in the State was one of the big factors in enabling him to develop his rye seedling test to such a satisfactory degree.

The author discusses the efforts of German farmers to increase their production to the highest possible degree, and the necessity of giving constant attention to the fertility of the soil. Such heavy drain on the nutrient supply would soon deplete the soil if care was not taken to test the soils from time to time to see whether the nutrient supply was being maintained. The great importance of proper soil sampling is stressed, and the desirability of training workers in sampling technique is advanced. The value and limitations of the information gained from the Neubauer or other soil-testing methods are briefly discussed.

The Development of Potash Consumption in Saxony. *By A. Müller, Dresden, Germany.*

The author gives data on the use of potash in Saxony, comparing usage with other sections of Germany. In 1914, this State used about 14.5 pounds of actual potash per acre, about the same as the average for all Germany. During the twenties, the usage in Saxony increased rapidly, much more so than for the rest of the country, reaching a high point of about 32 pounds per acre. Following a recession in the early thirties, potash consumption increased rapidly in both Saxony and Germany as a whole, with average usage 39.5 pounds and 35.5 pounds per acre respectively for 1938.

THE USE OF POTASH FERTILIZER ON BUSH BEANS. *By K. Boshart, München, Germany.*

Information on the use of fertilizers on beans is of great importance to the grower, since this crop is highly susceptible to fertilizer burn. Several years' work on a sandy soil very low in organic matter showed that potash fertilizers were not able to exert a beneficial influence unless manure also was used. When the beans were grown on soil not containing the nodule organisms, the fertilizer was ineffective in a manner similar to a lack of manure, while when the seed was inoculated, the beans responded well to higher applications of fertilizer. Further experiments showed that the highest rate of potash application gave the highest yield and net profit. This fertilization consisted of 45 pounds of nitrogen, 80 pounds of phosphoric acid, and 145 pounds of potash per acre. The fertilizer was applied broadcast before seeding, except for some potash top-dressing applications. Applying the potash as top-dresser gave slightly better yields in some cases. In a comparison of the muriate and sulphate forms, the latter usually gave better results. The author does not believe it is a matter of the sulphate or chloride radical being more or less beneficial to the bean, since the ammonium salts with the same radicals are about equal in their action on beans. He believes it may be due to the impurities in the muriate, which contained 40% actual potash.

THE NUTRITION OF THE APPLE TREE. *By M. A. Blake, G. T. Nightingale, and O. W. Davidson, New Brunswick, New Jersey.*

This is a review of Bulletin 626 of the New Jersey Agricultural Experiment Station. The careful technique employed in carrying on this work is described. The effects of the different nutrients or the lack of one of them on the root development, top growth, and appearance of the leaves of the young trees are shown by illustration and given in the text in some detail. A table summarizes the growth data for the differently fertilized trees. The lack of any of the nutrients was very unfavorable, best results being produced by a complete fertilization.

WEEDS. *By M. Zehentner, Berlin, Germany.*

This article gives a short description, growing habits, and control of three weeds, the spear thistle, meadow saffron, and bog horse-tail. They are also illustrated.

OBSERVATIONS ON ALPINE PASTURES. *By L. Tschumi and J. Stalé, Lausanne, Switzerland.*

Experimental work was undertaken to determine whether commercial fertilizers could be used to improve the condition of Alpine pastures. Various types of farm manures have been used in the past, but these have not maintained the pastures, and they became weedy. Phosphate, potash, and nitrogen fertilizers, alone and in combination, were tried at several locations. The combination of phosphate and potash was very effective in increasing the yield of forage and in increasing the mineral and protein contents of the plants. In some cases, complete fertilizer was best. In a test of the effect of a complete fertilizer on the botanical composition of the pasture, the legumes were about tripled, with a corresponding decrease in weeds, compared to the unfertilized area. The proportion of grasses was increased slightly.

THE EXCRETION OF NUTRIENTS BY PLANT LEAVES. *By H. H. Müller, Germany.*

In this literature review, the work of several workers on the excretion of nutrients by leaves is briefly discussed, and the experiments of van Schreven of The Netherlands are summarized. Various experimenters had observed that the total amount of a nutrient contained in a plant frequently was less

at maturity than during the growing season. A part of the loss was attributed to washing of the nutrients out of the leaves, but a large part was thought to be due to migration of the nutrients back to the soils through the roots. Work is quoted which indicates that very little movement takes place under the latter category, since plants growing in protected locations, where no water runs over the leaves, show practically no loss of nutrients. The work of van Schreven shows that rather large quantities of nutrients are lost by the leaves when they are subjected to prolonged washing with water. In a case of sugar beet leaves, the loss of potash in this way that could be measured during the three summer months amounted to almost 24 pounds per acre. This was followed rather closely by sodium, with rapid falling off for calcium, magnesium, phosphorus, manganese, and iron, the amounts of the latter three being very small. The actual washings from the leaves were even greater than these values, since all the water running off the leaves could not be recovered. A washing of short duration had little leaching effect on the leaves. Attention is drawn to the significance of these findings in connection with the collection of leaf samples for analysis to determine mineral content. Continued rains will have an important effect on the contents, although short washings in the laboratory introduce practically no error.

SYMPTOMS OF FUNCTIONAL DISTURBANCE IN RED CURRANT BUSHES DUE TO UNBALANCED MINERAL NUTRITION. *By M. P. Löhnis, Germany.*

Observations on red currants had shown that potash deficiency and chloride injury symptoms were in some respects similar. Further work was inaugurated to differentiate more closely these sets of symptoms. Chloride injury begins with a rusty brown discoloration of the tip of the leaf, followed by desiccation. Individual spots gradually enlarge until the entire tip is included. The browning thus does not run parallel to the leaf margin, as is the case with potash deficiency. The color of the discoloration is not so characteristic as is its form and position. Small amounts of chlorine in combination with potassium or calcium were beneficial, but combined with sodium were not beneficial. Boron deficiency, in contrast to potash deficiency, affects the youngest leaves. This is thought to be due to its lack of mobility in the plant. Sulphur injury could not be induced.

SOIL ANALYSIS AS A BASIS FOR FERTILIZER ADVISORY WORK. *By H. Neubauer, Dresden, Germany.*

Since the German government has decided to use the Neubauer-rye seedling method for making recommendations for phosphate and potash fertilization, the author prepared a semi-popular article describing the basis of the method, and how he arrives at the limiting values designating whether or not fertilizer is needed. The amount of soil used in the test is 100 grams, and the results of the analysis are expressed in milligrams, or parts per hundred thousand. It is assumed the plant can forage through about 8 inches of soil, which with a volume weight of 1.5, would weigh about 3 million kilograms. Thus each milligram of nutrient shown by the test represents 30 kilograms in a hectare of soil to normal depth. Experimental work has shown what part of the total available potash the plant can use during a season, this foraging power varying with kind of plant. It is considered that barley can use 12% of the available potash in one season, wheat 15%, potatoes 25%, beets 33%, oats, rye, red clover, rape, alfalfa, and grasses 20%. Barley can use 20% of the available phosphoric acid present, while other plants can use 33%.

The limiting value to determine whether or not fertilizer should be applied is influenced by the yield expected, since this will determine how much nutrient the plants will use. For example, if a barley yield of 70 bushels is nor-

mally expected from a soil, 85 kilograms of potash per acre will be required by the grain and straw, and the limiting value of potash that should be present is calculated as follows: $85 \cdot \frac{100}{12} \cdot \frac{1}{30} = 24$. For phosphoric acid of which the crop would need 35 kilograms per hectare, the calculation would be as follows: $35 \cdot \frac{100}{20} \cdot \frac{1}{30} = 6$. Thus the Neubauer test for the soil should show 6 mg phosphoric acid and 24 mg potash, and if the results are lower, a fertilization should be added in proportion to the deficiency. In addition to nutrient removal by the crop, the volume weight of the soil, and the foraging power of the plant are factors, as brought out by the formula.

The basis of soil management, and fertilization in German agriculture is the replacement of the nutrients removed by the crop, and if the fertility of the soil is not up to the desired level, even more than crop removal will be applied for a time. Dr. Neubauer groups soils on the basis of his test in the following manner: less than 15 mg potash and 4 mg phosphoric acid, poor in these nutrients, 15-26 mg potash and 4-7 mg phosphoric acid, moderately well supplied, and well supplied if more than these amounts are found to be present.

***La Potasse,***
***May/June 1939, Vol. 13, No. 121***

GREEN MANURE A VALUABLE SOURCE OF HUMUS. *By L. Audidier, France.*

With the reduction of sheep and cattle herds due to lack of favorable pasturage, farmers are faced with the problem of reduced supplies of barnyard manure for their cropped fields. The most important part of the manure for the soil is its content of organic matter, which on decomposition supplies humus to the soil. The humus is so effective in improving the general properties of a soil that attention must be given to its maintenance. The use of green manure offers itself as a substitute for manure. This is the growing of a crop for plowing under before it is mature. A green manure crop adds large quantities of organic matter to the soil; it tends to concentrate near the surface of the soil quantities of easily assimilable plant nutrients, which the roots of the crop have gathered from the soil, sometimes from a considerable depth; the roots of the green manure crop tend to open channels in the soil in which roots of the regularly grown crops can go; and if legumes are grown as the green manure, they add considerable quantities of nitrogen to the soil from the air. This property of fixing nitrogen makes legumes favorite plants to use for green manure. The Belgian Institute for the Improvement of the Sugar Beet has found that turning under vetch will add to the soil 45-120 pounds of nitrogen per acre.

Green manure crops fall into two general classes, those planted in the spring and those planted in the summer. Included in the former are red clover, hop trefoil, and alsike clover. The summer-seeded crops include winter vetch, peas, horse beans, crimson clover, and lupine. If these crops are to develop favorably and be in a position to fix nitrogen from the air, they must be well supplied with phosphate and potash. The author recommends 350 pounds of superphosphate or 135 pounds of bicalcic phosphate and 180 pounds of muriate of potash per acre as fertilization for the green manure crop. He states that if all the fertilizer is not used by the crop to be plowed under, it will be in the soil for the following crop, along with the nutrients in the crop turned under. A table prepared by the above named Belgian Institute giving the rate and depth of seeding, yield of green matter likely to be produced, and nitrogen contained in the above-ground part of the plant (usually considered as being the part fixed from the air) for the various legumes mentioned, and mixtures of them, has been included.

THE ENSILAGE OF GREEN FORAGE. *By G. Courtois, France.*

The ensiling of green forage in either stacks or pits is discussed. Directions for making good silage are given in some detail.

THE TREATMENT OF CHLOROSIS DUE TO LIME. *By J. L. Vidal and J. Lafon, France.*

In some sections of France where the soils are highly calcareous, growers frequently are troubled with a chlorosis or yellowing of plants. This is caused by an alteration in the chlorophyll, or green coloring matter in plants, due to the effects of lime. The lime causes the iron to change from a soluble to an insoluble form, and thus becomes unavailable to the plants. The authors propose to correct the situation by making a solution of ferrous sulphate and mixing with it citric acid. The latter keeps the iron compound from oxidizing and becoming unavailable to the plants. This solution is painted on pruning wounds, sprayed on leaves, or placed in a trough around the trunk.

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# Some Fundamentals of Soil Management

(*From page* 14)

ones. Furthermore, well-nourished plants have large, wide-spread root systems that serve to bind the soil together and thus to hold it against washing. In addition limed and well-fertilized soils are in themselves resistant to erosion.

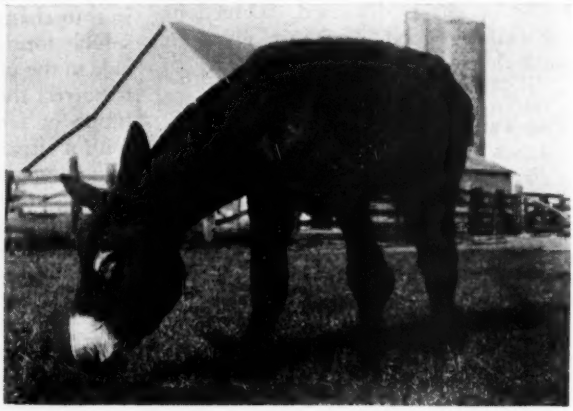
### Recommended Practices

To sum up, it may be urged that the following old-fashioned soil-management practices are absolutely essential today.

1. Liberal, regular, frequent additions of organic matter to the soil by all feasible means.
2. Use of nitrogen and potash wherever crops produce a profitable increase from their use.
3. Liberal applications of phosphorus on all soils deficient in this element.
4. Use of one or more of the trace elements wherever a shortage of any of them is known to exist.
5. Thorough tillage, including seedbed preparation, and cultivation for complete control of weeds.
6. On sloping lands all tillage operations on the contour in humid areas. In dry areas, across the direction of the prevailing winds.
7. Planting and tillage of all intertilled crops and seeding of small grains, millet, sudan grass, cowpeas, and soybeans on the contour on all sloping erodible lands.
8. Alternating intertilled crops, such as cotton, tobacco, potatoes, corn, and beans in narrow contour strips with close-growing crops, such as grass and leguminous hay crops, separate or mixed but preferably mixed, and small grains, preferably winter grains.
9. Protecting long slopes with diversion ditches for collecting and carrying water off slopes to a safe disposal area. Terracing slopes for precisely this same purpose, particularly in areas of high-intensity rainfall and of soils with a low-infiltration ratio. In highly erosive situations strip-cropping on terraced land.
10. Protection for steeper slopes by seeding them to long-term meadow or pasture mixtures of grasses and legumes.
11. Return to forest of all sloping land not really needed for other purposes.

# Animals Recognize Good Soil Treatment

(*From page* 21)



**The fine pedigree of this Jack couldn't overcome the mineral deficiencies in the ration limited to crops grown on an untreated, mineral-deficient soil.**

The animals confined to our farms are exercising the best of their judgment to make good use of their feed and are pointing out, whenever possible, that the feed is better as the soil fertility is higher. So far, they have pointed to lime and to phosphates as essential in making the feed better to their taste, and doubtless, to their more effective growth, milk production, and other body functions. As fast as we set conditions that will let them demonstrate that they can pass even better judgment than we can, they may point to other fertility items in which our soils are deficient for best feed production. Given a chance, our animals may teach us to appreciate our declining soil fertility.

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# Portable Seed-cleaning Is Profitable

(*From page* 12)

possible only by the volume the machine is able to reach during the season.

Some stationary cleaning plants have been installed in the area in the past, but their operations were not successful, largely because it was impossible to get the farmers to bring their seed in more than a week or 10 days before planting time. The short period during which this equipment was in use so limited the season's operations that this stationary set-up was not successful in servicing the seed grain or making operation expenses.

The portable units start out from 6 to 8 weeks before seeding time and, by going direct to the farm to do the work, have lengthened the season of operation to a point where they can operate profitably on a bushel charge that is in most cases lower than that charged by the stationary operator. It has been found that when growers become accustomed to this service they are glad to take advantage of it early in the season, as has been proven by the 7 years of operation in the lower Wabash Valley, where each year ⅓ of the wheat seed sowed is serviced by this type of equipment. Stinking smut has been completely eliminated from wheat in this area by treating the seed in those communities where infestations were found.

The portable unit complete weighs about as much as 40 bushels of wheat. It is much more convenient and economical to move the equipment to the seed than to move the seed in to a central point.

# Minor Element Fertilization of Horticultural Crops

(*From page* 19)

acter of the foliage occurring on the plant. These are only a few of the recommended uses of minor elements in Florida horticulture.

The recommended use of the so-called "minor elements" would be a long task if all the Southern States were to be considered. To discuss the subject from this direction would require a complete description of the symptoms that occur when the quantity of certain elements other than nitrogen, phosphorus, and potash is so limited in amount or so unavailable to the plant that the nutritional needs of the plant are not met. This information may be secured from technical journals and experiment station bulletins far more accurately than it could be presented here.

However, the work that has been done in the South indicates very distinctly that the problems created by the discovery that elements other than nitrogen, phosphorus, and potash are of major importance in producing crops are innumerable and of the utmost importance. The effects of fertilizing with minor elements will have a profound effect on the experimental work with horticultural crops. This group of problems I wish to call to your attention, with the hope that it may bring assurance that they are not as serious as they appear to be.

How widely the fact is recognized that insufficient magnesium, manganese, copper, zinc, and boron for the adequate nutrition of the plant can nullify the results of an otherwise carefully planned fertilizer, cover-crop, or other similar test I do not know, nor do I know how many plant breeders and horticulturists are considering minor element fertilization of importance in their particular activities. I do know that, if a worker in any phase of horticulture will critically review the literature, he will observe that minor element studies are not a fad but are of so much importance that one is even hesitant to indicate the response that has been secured from their use.

Certainly, it is not a wise man who would attempt to foretell the future, but I am firmly convinced that any person working with horticultural crops, whether that work be fertilization, plant breeding, variety testing, cultural, or pathological, can no longer neglect to recognize the importance of the minor elements. In fact, it is amazing that the lack of such small quantities of materials can create such havoc; or, if we desire to be optimistic, how much good can be created by such small quantities of relatively cheap materials. Not only must the horticulturist examine his future program of work, but much of the work already done will have to be critically reviewed.

### Progress of Tung Oil

Since rather strong accusations have been made against certain types of work, I think probably it would be well to take time to present some reasons for these accusations. Along the Gulf Coast, horticulturists are quite interested in watching the growth of the tung-oil industry. The growth of this industry is very closely correlated with the growth of the tung-oil tree. The acreage planted to this crop expanded quite rapidly during the years 1930 to 1933. Some of these commercial groves were made on soil having a high content of phosphate; the young trees grew rapidly for several years and then began to die. I will not attempt to describe the progressive stages of decline. It is sufficient here to report that many of the trees ultimately died unless supplied with zinc. Detailed description of the

plant, recommended treatments, and other experimental data on this problem are reported in Florida Agricultural Experiment Station Bulletin 273 by Harold Mowry and A. F. Camp. The conclusion we wish to draw from this work is that any fertilizer test conducted with this crop would simply have resulted in death of the plant unless, by chance, one of our fertilizing materials contained zinc as an impurity. Of course, this is an extreme case.

### A Potash Experiment

Allow me to present one more case from our Experiment Station. At the Lake Alfred Citrus Station, an experiment was started to test the relative value of 3, 5, and 10 per cent potash when used in fertilizer mixtures for oranges. No decided differences from applying the varying quantities of potash could be statistically measured. However, it was noticed that the foliage of the trees in all treatments was abnormal. Zinc, copper, and manganese had been found in various soils of the State to correct certain definite types of abnormalities in leaves, so it was logical for the worker to determine if the chlorotic type of growth could be corrected by the addition of these materials. They were applied and it was soon evident that, even when these three materials were added, the growth of the tree was not normal. Beginning 3 years ago, magnesium was applied. The response was remarkable. There was evidently an acute need for magnesium. Those trees which have received sufficient magnesium and the other necessary minor elements are now showing normal growth, increased vigor and productivity. Is it too much to expect that now the differences from the varying amounts of potash may appear?

Both of the examples mentioned are extreme cases, but by no means are they isolated cases. Fertilizer tests were conducted for years on soil now known to show constant response when manganese is applied; other tests have been conducted on soils now known to be deficient in boron, magnesium, and zinc respectively. Many of you know of the paper at Richmond that reported more response from 3 pounds of borax than from 1,000 pounds of fertilizer when applied to Narcissus. Fertilizer tests or experiments are not the only ones to be influenced by the insufficiency of certain plant nutrients.

Mr. Blackmon of the University of Florida Agricultural Experiment Station has conducted some extremely interesting and valuable work with cover crops in pecan groves. Results from these tests are published in Experiment Station Bulletin 297. Later work by Mr. Blackmon has shown that pecan trees not showing rosette are benefited by the application of zinc. This was done on the same soil type as that on which the cover-crop work was conducted. Recalling some of the earlier work with citrus Frenching, pecan rosette, and other similar troubles which showed that a partial correction of these troubles might be secured from organic materials, one begins to wonder if the cover crop may be a source of zinc and other minor elements. If this is so, certainly our selection of cover crops could be made more wisely. But more important, it seems to me, would be to determine the effects of cover crops if the variable of zinc deficiency were eliminated.

### Testing New Varieties

One routine task of every horticultural department is the testing of newly introduced varieties and, within recent years, this has included the development of new varieties. Horticulturists have for years recognized the fact that it is necessary to control all possible variables in conducting such work. A deficiency of iron, copper, magnesium, or manganese is apt to be as important a variable as soil type, moisture, length of day, temperature, disease, or insects. There is evidence that suggests a varietal response to deficiencies of minor elements. This varietal response was first observed by the writer on a series of soil acidity

plots at the Cornell University Long Island Research Farm. Snowball cauliflower grown on plots having a low pH value developed a condition known as whiptail; the variety Erfurt, grown on the same plots, was normal.

Certain sweet corn varieties were grown in soil subsequently found to be deficient in zinc. Many of the varieties failed to produce any crop, although other varieties produced a satisfactory crop. Zinc was applied to the soil and the same varieties again grown. This time the variety that failed to produce a crop in the first year now produced quite satisfactorily when compared to any variety in the test. These observations are indicative, but the recent work reported by B. R. Fudge in University of Florida Agricultural Experiment Station Bulletin 331 emphasizes the fact that there is a distinct difference in the susceptibility of varieties of grapefruit to magnesium deficiency. Dr. Fudge shows that the variety Marsh Seedless will not show bronzing (magnesium deficiency) as quickly as will the varieties Duncan, Walters, or Excelsior. He shows that the difference is due to the magnesium removed in the seed of the seedy varieties Duncan, Walters, and Excelsior. Dr. Fudge recommends the application of magnesium to correct bronzing. I have no doubt that the plant breeder could see another solution, that is, the development of additional varieties without seed, suitable for Florida conditions.

These few observations on the apparent difference in response of varieties to deficiencies of certain elements, I believe, are enough to indicate to the plant breeder and horticulturist that it is as important for him to recognize nutritional factors, as well as physiological and pathological ones in the development and testing of varieties.

There is another phase of work that I believe should be carefully reviewed, although I am frank to admit that the evidence here is not, in my estimation, particularly strong. However, it was only a few years ago that pathologists were searching for the organism responsible for troubles now recognized as nutritional deficiencies. Is there a possibility that, by correcting nutritional deficiencies in plants, we will prevent the occurrence of certain pathogenic troubles? Or will the adequate nutrition of the plant assure the organism a balanced diet and thus increase the amount of disease? Probably both will occur, depending upon the type of organism involved. But, forgetting pathogenic disorders, there are unquestionably many physiological disorders that may be caused by the lack of certain elements necessary for the nutrition of the plant. To name just a few, we have tomato puff, white heart of watermelons, blossom-end rot of tomatoes and a similar trouble on peppers, skin cracking on sweet potatoes, skin blotch on a number of fruits and vegetables, and a host of others.

### Further Research Needed

I believe that sufficient evidence has been presented to indicate that horticultural research will be greatly influenced by the research with minor elements. If the problem is so important, what is to be done about it? That is the question I wish some one of you would answer for me. There are certain things that can and should be done. Up until the present time few deficiencies have been found where they could not be seen. In other words, the deficiency appears in the form of abnormal growth before any attempt is made to find its presence. In fact, at present, there is no way that I know of to determine accurately whether or not there is a sufficiency of the various materials available in the soil to provide adequately for the needs of the plant.

It is true that we are rapidly approaching the solution of this problem with certain elements, but it will be some time in the future before this is done for all plants on all soil types. It is impossible for research workers to attempt to correct deficiencies on experimental plots unless deficiencies have been observed, inasmuch as many of

these minor elements are toxic as well as beneficial. Thus I feel that it is vitally important for horticulturists to describe and report accurately abnormal growth of any type occurring in any of their experimental work; if possible the plants showing abnormal growth should be photographed, in color whenever this can be done. This means the reporting of plants affected by disease as well as those showing physiological disorders.

There is one more important item that the horticulturist should note, and that is the soil type that the crop is produced on. Soils men are finding that there is a definite correlation between the soil type and the availability to the plant of certain mineral nutrients. Not only should the soil be classified, but the treatment of that soil should be carefully noted.

It appears that I have taken quite a long time to say that (1) the growth (particularly abnormal growth) of any plant on experimental plots should be carefully described; (2) that the soil on which the crop is produced should be accurately classified and a description of it given; and (3) that the treatments and materials used be described. However, I wished to bring all the emphasis I possibly could on these points, because I believe that they are exceedingly important, not only to our own stations but to workers in other stations. I trust no worker will abandon a series of fertilizer plots or any other experimental work because he feels that a deficiency may be present, but at the same time, I trust that every experimental worker with horticultural crops, irrespective of the type of work, will be awake to the fact that his results may be influenced by small quantities of some particular element.

# The Use of Potash on Idaho Soils

(*From page* 18)

ments in other States have shown that the largest increased yields are obtained from the application of potash in combination with other fertilizer materials, particularly phosphate. Results obtained in numerous fertilizer demonstrations in which these crops were used as test crops are presented in table 7.

TABLE 5.—RESULTS OBTAINED IN 1937 FROM FERTILIZER APPLICATIONS MADE TO BARLEY PLATS AT THE SANDPOINT BRANCH STATION *

| Treatment | Yield Grain Plus Straw | | Yield Grain | |
|---|---|---|---|---|
| | Per Acre | Increase | Per Acre | Increase |
| | *Tons* | % | *Bu.* | % |
| Check Average | 1.85 | ..... | 43.5 | ..... |
| $NaNO_3$ | 2.57 | 39 | 56.1 | 29 |
| $(NH_4)_2SO_4$ | 2.16 | 17 | 49.6 | 14 |
| P | 1.85 | 1 | 43.1 | −1 |
| K | 1.42 | −23 | 37.8 | −13 |
| NP | 2.61 | 41 | 58.2 | 34 |
| NK | 2.81 | 52 | 65.2 | 50 |
| PK | 1.90 | 3 | 48.2 | 11 |
| NPK | 2.57 | 39 | 62.6 | 44 |
| Gypsum | 1.68 | −9 | 45.6 | 5 |
| Manure | 2.16 | 17 | 53.0 | 22 |

* Annual report of the University of Idaho Branch Station at Sandpoint, Idaho, 1937.

TABLE 6.—RESULTS OF ONION FERTILIZER DEMONSTRATION IN SOUTHWESTERN IDAHO

| Treatment | Yield | | Grade | | |
|---|---|---|---|---|---|
| | Per Acre | Increase | 3 in. + | 2-3 in. | Culls |
| | *Sacks* | % | % | % | % |
| Check | 600.7 | ..... | 51.5 | 24.4 | 24.1 |
| 25# $(NH_4)_2SO_4$<br>173# Ammonium Phos.<br>175# $K_2SO_4$ | 684.8 | 17.9 | 41.0 | 31.3 | 27.7 |
| Check | 561.1 | ..... | 49.4 | 30.3 | 20.3 |
| 200# TSP<br>175# $K_2SO_4$ | 729.4 | 29.6 | 48.6 | 25.3 | 26.1 |
| Check | 564.4 | ..... | 42.8 | 27.5 | 29.7 |
| 200# TSP | 714.5 | 26.6 | 25.5 | 32.8 | 41.7 |

TABLE 7.—RESULTS OBTAINED IN FERTILIZER DEMONSTRATIONS ON IRRIGATED SOILS ALFALFA, BEETS, POTATOES, AND PEAS WERE THE TEST CROPS DURING 1935–38

| Crop | Increase Due to Treatment | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $P_2O_5$ | | $P_2O_5$–$K_2O$ | | N–$P_2O_5$ | | N–$P_2O_5$–$K_2O$ | |
| | No. of Plats | Increase Per cent | No. of Plats | Increase Per cent | No. of Plats | Increase Per cent | No. of Plats | Increase Per cent |
| Alfalfa | 22 | 18.2 | 22 | 17.7 | ..... | ..... | ..... | ..... |
| Beets | 14 | 25.3 | 14 | 14.9 | 14 | 24.4 | 14 | 14.9 |
| Peas | 11 | 9.6 | 11 | 12.4 | 8 | 12.4 | 8 | 3.7 |
| Potatoes | 7 | 7.5 | 7 | 6.4 | 6 | 31.8 | 5 | 21.7 |

The ratio of nitrogen to phosphate ($P_2O_5$) used in these demonstrations varied from 1-3 to 1-5. The ratio of phosphate ($P_2O_5$) to potash ($K_2O$) varied from 1-1 to 3-1. The ratio of N-P-K (N-$P_2O_5$-$K_2O$) in the complete fertilizers varied from 1-3-1 to 1-3-3.

The application of phosphate alone to alfalfa and beets has proven most profitable in Idaho. Application of potash alone to alfalfa in a few fields in southwestern Idaho has produced profitable increased yields. The application of nitrogen plus phosphate has produced larger increased yields of beets than have applications of phosphate plus potash. There are special soil conditions under which different responses from those shown in the above table are obtained. The past management of a soil has a great effect on the response which may be obtained with various fertilizer materials.

A series of 17 fertilizer demonstrations using potatoes as the test crop were conducted in south central and southeastern Idaho in 1932.[1] The treatments used included phosphate alone, nitrogen plus phosphate, and a 5-20-10 complete fertilizer. The net profit per acre from each treatment was $3.74, $3.10, and $0.51 respectively. These demonstrations were conducted on soils ranging from sandy to clay loams. The

[1] Fertilizer Trials in the Potato-growing Districts of Idaho by G. R. McDole.

TABLE 8.—RESULTS OBTAINED IN ALFALFA FERTILIZER DEMONSTRATIONS CONDUCTED AT CALDWELL SUBSTATION DURING 1937–1938*

| Treatment | Yield 1937 | | Yield 1938 | | Ave. Increase for 2 years |
|---|---|---|---|---|---|
| | Per Acre | Increase Due to Treatment | Per Acre | Increase Due to Treatment | |
| | *Tons* | *Per Cent* | *Tons* | *Per Cent* | *Per Cent* |
| Average of 7 checks | 5.82 | ..... | 6.98 | ..... | ..... |
| 125# Sodium Nitrate | 5.31 | −8.7 | 6.42 | −8.0 | −8.4 |
| 125# Treble Superphosphate | 5.63 | −3.3 | 6.78 | −2.7 | −3.0 |
| 200# Gypsum | 5.70 | −2.1 | 6.43 | −7.9 | −5.0 |
| 125# Sodium Nitrate + 125# Treble Superphosphate | 5.82 | 0 | 5.97 | −14.4 | −14.4 |
| 125# Sodium Nitrate + 100# Potassium Chloride | 6.45 | 10.8 | 7.17 | 2.7 | 6.7 |
| 125# Treble Superphosphate + 100# Potassium Chloride | 6.30 | 8.2 | 7.81 | 11.9 | 10.0 |
| 125# Sodium Nitrate + 125# Treble Superphosphate + 100# Potassium Chloride | 6.50 | 11.6 | 7.75 | 11.0 | 11.3 |
| 125# Sodium Nitrate + 125# Treble Superphosphate + 100# Potassium Chloride + 200# Gypsum | 6.66 | 14.4 | 7.77 | 11.3 | 12.8 |
| 125# Sodium Nitrate + 200# Gypsum | 6.3 | 8.6 | 7.37 | 5.7 | 7.1 |
| 125# Treble Superphosphate + 200# Gypsum | 5.96 | 2.4 | 7.27 | 4.2 | 3.3 |

* Annual report of the University of Idaho Branch Station at Caldwell, Idaho.

sandy soils did not respond to the application of the complete fertilizer any better than did the heavier soils.

Data obtained in an alfalfa demonstration conducted at the Caldwell Branch Station and presented in table 8 further substantiate the previous data and statements that the greatest response from the application of potash fertilizers has been obtained in southwestern Idaho. At this station the application of potash in various combinations has brought about the largest increased yield. Since this station is maintained principally for sheep and cattle feeding investigations, each field receives regular applications of rich farm manure.

Samples from all the agricultural soil areas of Idaho have been analyzed for available potash. Amounts present have varied from none in muck soils to 1,000 pounds available $K_2O$ per acre in mineral soil. Although one soil contained the higher amount, a potassium application improved the quality of onions grown on it. Some soils containing less than 500 pounds of potash per acre have been showing response to potash applications. Since crops vary in their response to potash applications, the amount of potash which must be present and above which no response can be expected from further application, will vary.

The results obtained in Idaho with the use of potash-containing fertilizers can be summarized as follows:

1. Peat and muck soils respond consistently to high potash-containing complete fertilizers.

2. No consistent results have been obtained from potash-containing fertilizers on cut-over soils.

3. Southwestern Idaho mineral soils have shown more response to potash fertilizers than those in any other irrigated district.

4. Quality and yield of truck crops have been improved by the use of potash-containing fertilizers. (The largest acreage of truck crops is in southwestern Idaho.)

5. Alfalfa, beets, potatoes, and peas have shown greatest response to soluble phosphate alone or nitrogen plus phosphate applications more consistently than they have to potash or potash plus phosphate combinations.

6. The use of potash-containing fertilizers may be expected to increase in the future due to the soil depletion or increase in acreage of crops showing marked response to potash applications.

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# Indexing Potatoes Controls Diseases

(*From page* 10)

following year this indexed- and unit-planted seed stock is planted as part of the regular fields. Fifteen bushels are required for an acre of potatoes, and since one acre will produce 200 bushels under normal conditions, a surplus of seed is soon available for sale.

"After the disease is practically eliminated by indexing, only the tuber unit planting is necessary from year to year to insure continued healthy seed stock," Brann points out. "However, it is advisable to check once in awhile by the index method to make certain that disease is still under complete control."

Indexing cannot be done by growers because field conditions will not always show the disease. For example, if the temperature is high, 80 degrees or so, the disease will not show up on the leaves of the plants. In addition, insects are carriers of these "running out" diseases, and healthy plants would be infected by them before the diseased plants could be discarded.

In greenhouses, the temperature is held at 60 to 65 degrees Fahrenheit, which is the ideal heat range to bring out crinkling and mottling on the leaves of the plants. Insects, of course, cause no trouble in this artificial environment.

Only potatoes that have been tested for disease under certification rulings are indexed. During the growing season, representatives visit the fields and tuber unit plots on the farms of the growers and help "rogue" out undesirable and diseased plants.

The purpose of the plan is not only the elimination of "running out" troubles but also to maintain the standard of excellency for certified seed. Southern States, which have rigid standards for these diseases, furnish a large market for Wisconsin growers, and every effort is put forth to meet the standards of their demands. The South does not raise its own seed stock because temperatures are not favorable for storage from year to year. Some few Southern growers use refrigeration to overcome the heat, but this is an expensive practice.

The Triumph, red in color, is the leading certified seed variety grown in Wisconsin, and the one best adapted to indexing. In 1938 around 150,000 bushels of certified Triumph seed were sent to Florida, Alabama, Texas, and Louisiana. The Green Mountain variety, popular in the East, mainly Long Island, Kentucky, and Tennessee, shows

sales of 25,000 bushels. Irish Cobblers, sold within the State and to Indiana, Illinois, Iowa, Ohio, and Virginia, show sales of 75,000 bushels.

The three varieties alone would require 10 trains of 40 freight cars each to handle the 1938 shipments of Wisconsin growers to out-of-State buyers.

Prices of $1.40 to $1.50 per hundred pounds were received by our growers for this certified seed in 1938, or from 84 to 90 cents per bushel. These prices are more than double the prices paid for ordinary seed.

"New potatoes of the Triumph variety, which Wisconsin consumers used this year, were shipped from the Southern States, particularly Florida. These 'table' potatoes indirectly represent the 1938 Wisconsin seed stock crop which was sold and shipped last fall to Southern growers. They, in turn, planted this seed during the winter months, mainly January, and harvested and reshipped the table stock for Wisconsin consumption. This procedure is followed until Wisconsin has its own varieties grown and harvested to put on the late summer and early fall consumer markets," according to Brann.

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# Clover Improves Florida Pasture

(*From page 9*)

maintenance of beef and dairy animals. One dairyman who has 35 acres of clover reports that 30 minutes grazing with 250 head of dairy cows increases the milk flow 50 gallons per day. This increase in milk production in terms of wholesale selling price of milk increases the returns $16 per day.

It is now apparent that clovers will definitely grow in Florida, as evidenced by Experiment Station research and subsequent clover plantings made by cattlemen. This is substantiated by the fact that most of those who have tried clovers are planning to increase their acreage.

**Cows grazing clover at the Florida Agricultural Experiment Station in February. The mixture of clovers (White Dutch, Little Hop, California Bur, and Persian) was planted in late October 1938.**

# Farewell to Summer

(*From page* 5)

sometimes discovers that summer sunshine and summer fragrance and summer's bestirring growth have an essence in them which does good things to men and makes them less inclined to sham, to snobbery, and insincere formality.

Please do not let the howling mob of historians and "matter-of-facters" slay me with an intruded thought that Mars is nearest the earth, that heat waves stir the blood, and that the storming of the Bastille and the World War came in July. Nay, I am just a dreaming, inland scribe and will not lay down my peaceful pen in deference to the sword. As Shakespeare said so often, "Go to!" (And I don't care where.)

Take doing things, for instance. In summertime I can spend more time doing nothing and get more inspiration out of it than a whole week of being supposedly busy at my winter fireside. And to clinch the argument and to prove how sane I am in this weird idea, I have heard farmers lately say the same thing too—since the advent of the combine and mechanical milker. Farmers have begun to find that leisure is something as valuable as a pen full of shoats, if you know how to dawdle along with it and not take it too seriously.

THERE is no better place to think a lot about a little and accomplish a heap of nothing without exertion than lying under an apple tree in full bloom —if you keep an eye on the bees! When the time comes that more farmers get their inspiration that way, we are going to have a declining farm problem. The choking surplus might be managed the same way in my double-summer plan, too. As it is we spend so much time worrying about things we can't stop or change individually that we lose out on some of the fun of being alive.

They say a savage and a child know best how to get the most out of life in the open. I should know, having been both. This summer I spent two weeks along a sandy lake beach forty miles from nowhere, most of the time wading or trying to dig up ancient Indian flints from pitted camp-fire sites. Once I glanced up to see a couple of tousled kids looking as purposeless and vacant as I, but they feared I might be a school teacher and hastened on. Had you welcomed me home afterwards your eyesight would never have revealed how washed and rested I was—down inside. That's what the summer does to you, if you don't take along too many books or problems or fret under too much dignity. What a relief it is from wintertime, when your business has you backed up to the ropes and you have to hit back to keep warm.

And after all, I guess life is almost like the seasons, too. Our springs and summers vanish much quicker than we planned and hoped, and before we hardly realize the fact we are up against the job of filling the storage cellar against the sure-fire winter spell. I fancy some of us are keen workers all summer, or else we get a snug spot under some ripe fruit tree and stay there until stuff begins to fall in our laps. A lot more of us are apt to be visionary and dangle along through the summer watching the cloud shadows and listening to the birds, so, like the old grasshopper legend, we arrive at the harvest time without many bundles in the rack.

We get just as tanned up and soaked with vitamins as the heavy-duty brigade, but we fail to bring home much bacon with our wild flowers. Maybe we have seen a little more, heard some things they didn't, and stopped to get acquainted with some insect which the hustlers scorned. Maybe we just had our fun first, and now we have to scrape the bins to carry us through the chilly season so we can think and live it all over again.

That's all right for me. It can't be changed now. Summer's gone for awhile, maybe for keeps. Tough luck,

yet I can take it. But sometimes I look across the sitting-room at the woman who shared the long summer with me, and I can't help feeling a bit thick about it. You know how it is—summer is hard to part with in anybody's life, but somehow women hate to see it go the worst. Counting the first gray locks, checking the calories, and noting the stiffness at the knees after dusting the stairs—those little signs of the passing seasons rather disturb a girl who has always been proud of her silky brown braids and stylish figure.

If she won't think you're sunstruck, you might risk quoting Thomas Moore to her. It would have to be that song you heard long ago at the church concert, before autumn leaves meant anything more sentimental than a good bonfire.

"Believe me if all those endearing
young charms
Which I gaze on so fondly today,
Were to change by tomorrow and
fleet in my arms
Like fairy gifts fading away.
Thou wouldst still be adored, as this
moment thou art,
Let thy loveliness fade as it will,
And around the dear ruin each wish
of my heart
Would entwine itself verdantly
still."

(Note—In quoting the same be sure to adroitly omit the word "ruin." (Moore was more careless than necessary.))

Lest my painstaking thesis be crassly misjudged, let it be known that nothing galls me more than symptoms of professional summeritis in the acute, greedy, commercial stages. Many a brook and shady nook has been cursed by these interloping scenery sellers, mountain mongers, and vista venders.

For so many farthings a day they allow cheap folks to indulge in all manner of shindigs and pot-rattlings in the holy of holies that nature built and man destroys. They paint tobacco signs on lichened rocks, throw rubbish on rustic scenery, stick up chicken shacks on points of vantage, and try to slake your wanderlust with wieners. To them the brief summer is a debauch of empirical competition, and the victims of their zeal are sore at summertime for quite a spell.

I am quite sure that when I get my double-summer arranged we will outlaw such goings on. Each man and woman is going to see his own summer as he wants to see it. Although I shall not be able to delete the mosquitoes or poison ivy or eradicate the jimson-weed and marijuana, I promise to keep what scenery there is inviolate. You can do the rest.

THANKS to the Injuns who planned things in my section before the white men came and balled it all up, we stilll have before us six or seven weeks of post-summering. I am glad they named it after the aborigines because you sort of smell the old smoke of their campfires in the haze hovering over our minor mountains during autumn. There are a softness and a balmy delight to the forthcoming Injun summer which salve my soul in the midst of regret at losing the real article.

The maple and oak leaves are painted in mighty good imitation of the herb colorings the redskins used on moccasins, leggins, and deer-skin shirts. Sometimes a far-off drumming by a partridge sounds like the clan call of the sachems for a council of war. The dry mullen leaves seem to offer you filling for a pipestone bowl. A cloud presaging fall rain resembles the signal smoke of the outpost as the poor old lost tribe wanders west.

So let's say farewell to one more summer and lay plenty of good intentions for making up for lost time in the next one. It's the best time of the year in which to ponder in peace, and what's more to the point for a canny Highlander—summer time is cheapest, sans school, sans coal, and sans clothes. Summer gives us the most of our food and the best of our scenery, and we can afford to overlook an occasional blistering spell. We forgive our wives don't we?

## DIDN'T MAKE IT

New angle on the old yarn about the friend who was visiting the bandage-covered friend in the hospital: "What happened?" queried the victim. "You were drunk and you bet you could jump out of the window and fly around the block," said the pal. "Why," howled the patient, "didn't you stop me?"

"Stop you!—I had $10 on you!"

---

"Does your wife play contract bridge?"

"Well, judging by what it costs her, I would say she plays toll bridge."

---

"Rastus, I'll pay you ten dollars just to lead that lion around."

"No, suh, boss, not me!"

"He won't hurt you; he hasn't got any teeth."

"Mebbe so, but I ain't going to be gummed to death by no old lion."

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"Get a good laugh at the bathing suits worn 30 years ago," observes Lem Berger, "'cause 30 years hence, there won't be nothin' to laugh at."

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## TIMELY ADVANCEMENT

Pat (pointing toward his heart)—"Sure it was here where I was struck by the enemy's bullets."

Mike (looking dubiously at him)—"Ay, man, sure and if ye had been shot through the heart ye'd have been killed."

Pat (shaking his head)—"Ye're wrong, Mike. At the time I was shot me heart was in me mouth."

"This girl is new on the coast and it's up to us to show her the difference between right and wrong."

"Okay, pal, you teach her what's right."

---

Tailor: "And how would you like a belt in the back mit a cuff in the pents?"

Irritated Customer: "How would you like a sock in the nose?"

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## NO BOY SCOUT

A golfer had lost his ball, and, not unnaturally, was inclined to be annoyed with his caddie. "Why didn't you watch where it went?" he asked, angrily.

"Well, sir," said the boy, "it don't usually go anywhere, and so it took me unprepared like."

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"Lesh go home now, Joe."

"Naw, I'm afraid to go home. Wife'll shmell m'breath."

"Hol' your breath."

"Can't. Sh'too strong."

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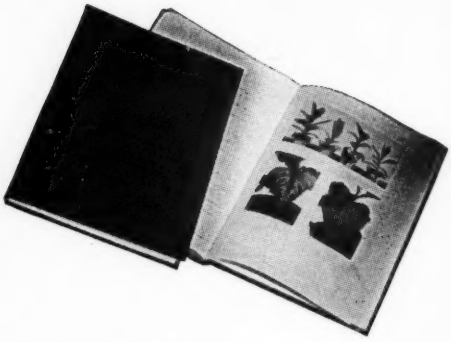
A man who was in court because he had knocked down and injured a man with his car said in defense that he was driving only 4 miles an hour.

Whereupon the lawyer for the motor accident victim countered with:

"Gentlemen of the jury, the driver of the car stated he was only going 4 miles an hour. Think of it. The long agony of my poor unfortunate client, the victim, as the car drove slowly over his body."

# POTASH DEFICIENCY SYMPTOMS



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